Xeelee

AN OMNIBUS

stephen baxter

Contents

Title Page
Copyright Page
Dedication
Introduction

RAFT
Chapter 1
Chapter 2
Chapter 3
Chapter 4
Chapter 5
Chapter 6
Chapter 7
Chapter 8
Chapter 9
Chapter 10
Chapter 11
Chapter 12
Chapter 13
Chapter 14
Chapter 15
Chapter 16

TIMELIKE INFINITY
Chapter 1
Chapter 2
Chapter 3
Chapter 4
Chapter 5
Chapter 6
Chapter 7

Chapter 8
Chapter 9
Chapter 10
Chapter 11
Chapter 12
Chapter 13
Chapter 14
Chapter 15
Chapter 16

FLUX

Chapter 1
Chapter 2
Chapter 3
Chapter 4
Chapter 5
Chapter 6
Chapter 7
Chapter 8
Chapter 9
Chapter 10
Chapter 11
Chapter 12
Chapter 13
Chapter 14
Chapter 15
Chapter 16
Chapter 17
Chapter 18
Chapter 19
Chapter 20
Chapter 21
Chapter 22
Chapter 23
Chapter 24

Chapter 25
Chapter 26
Chapter 27
Chapter 28
Chapter 29

RING

Chapter 1
Chapter 2
Chapter 3
Chapter 4
Chapter 5
Chapter 6
Chapter 7
Chapter 8
Chapter 9
Chapter 10
Chapter 11
Chapter 12
Chapter 13
Chapter 14
Chapter 15
Chapter 16
Chapter 17
Chapter 18
Chapter 19
Chapter 20
Chapter 21
Chapter 22
Chapter 23
Chapter 24
Chapter 25
Chapter 26
Chapter 27
Chapter 28

Chapter 29
Chapter 30
Chapter 31
Chapter 32
Chapter 33
Chapter 34
Chapter 35

TIMELINE

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Xeelee: An Omnibus

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This omnibus first published in Great Britain in 2010 by
Gollancz
The Orion Publishing Group Ltd
Orion House
5 Upper Saint Martin's Lane
London, WC2H 9EA
An Hachette UK Company
This eBook first published in 2010 by Gollancz.
A CIP catalogue record for this book is available from the British Library.
eISBN : 978 0 5750 9044 6
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To my wife, Sandra

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INTRODUCTION

While many science fiction authors have written serial stories or novels that share the same backdrop and characters, only a handful have constructed meticulously imagined, chronologically consistent future histories that encompass substantial vistas of time and space, and of those future histories, few are as ambitious as Stephen Baxter's Xeelee Sequence.

The first true future history was created by Olaf Stapledon in his novels *Last and First Men*, *Last Men in London*, and *The Star Maker*, starting in the teeming metropolis at the heart of the British Empire at the beginning of the twentieth century, and accelerating through aeons and galaxies to a final encounter with the being at the heart of creation. It's a masterpiece, but a chilly one, its story of the evolution of symbiotic cosmic consciousness visionary but remote from ordinary human concerns. A few years later, in the pages of *Astounding Science Fiction* magazine, Robert A. Heinlein charted a smaller scale but no less ambitious future history that, beginning the day after tomorrow, conscientiously chronicled mankind's climb from the cradle of the Earth to the near stars. The long evolutionary and cosmological perspectives of Stapledon (and H.G. Wells) have been absorbed and developed by many British writers, most notably Arthur C. Clarke, and Greg Bear and Robert Reed have given them an American slant, but Heinlein's model has provided the blueprint for most subsequent science fictional future histories because it easily accommodates the kind of genre-friendly stories of enterprise and boldness that are dwarfed to irrelevance by Stapledon's cosmological Agape. The future histories of Poul Anderson, James Blish, C.J. Cherryh, and Larry Niven, amongst others, derive much of their structures and tropes from Heinlein's pioneering framework. Baxter's Xeelee Sequence owes something to Heinlein too, with its hard SF extrapolations and vigorous straight-from-the-heart-of-genre story of humanity's ascension to the centre of the galactic stage, but it skilfully blends those core SF tropes with cosmological perspectives rivalled only by those of Olaf Stapledon (like Stapledon, Baxter was born in Liverpool) to create something new and different: an ambitious and ferociously detailed future history whose span is no less than that of the entire universe, from the Big Bang twenty billion years ago, through some

ten million years of human history, to the long, slow dying of the light that dwindles away into timelike infinity.

Stephen Baxter has also published the Victorian alternate history *Anti-Ice*, and *The Time Ships*, a very fine hard SF sequel to H.G. Wells's *The Time Machine*. He's written a trilogy of novels based on extrapolations of NASA plans and technology; a series about a species of intelligent mammoth; an alternate near-future trilogy revolving around a space entrepreneur; a stand-alone novel, *Evolution* , that chronicles the story of the development of the human species from dinosaur-dodging burrowers to simplified far-future descendants; and an ongoing series of apocalyptic novels in which Earth is flooded with water kilometres deep. He's also published novels in collaboration with Arthur C. Clarke, a biography of the pioneering Scottish geologist James Hutton, and a series of essays about the future. The list is by no means comprehensive. Restless, energetic, and ambitious, he is fast becoming the contemporary default voice of British SF, and the novels and stories of the Xeelee Sequence constitute his masterwork.

The universe of the Xeelee Sequence teems with life: life, and the evolution of self-aware consciousness, are as fundamental as the Planck constant, the speed of light, the strength of the electromagnetic force, or the Newtonian constant of gravitation. Life arises wherever it can and invariably gives rise to Mind; Mind seeks to spread everywhere and to survive for as long as possible. And by everywhere, I mean *everywhere*: an entire civilisation evolves and seeks refuge in the yoctoseconds after the Big Bang before symmetry is broken and the laws of physics crystallise; other strange and wonderful empires rise and fall before the quagma froth cools enough to allow creation of baryonic and dark matter, and the beginning of a great war between the Xeelee, powerful champions of life based on ordinary atoms and electrons, and the patient and inscrutable dark matter photino birds. Twenty billion years pass before the war between the Xeelee and the photino birds intersects with human history, and humans painstakingly claw their way up from the status of lowly pawns in the hands of enigmatic and casually cruel alien species to great players on the universal stage.

Of that very first species of intelligent being, the monads, Baxter remarks '[they] cared nothing for humans, of course, or for quagmites, or

Xeelee, or photino birds, or any of the rest of the universe's menagerie at this or any other age. But they like their universes to have *story*; and it was living things that generated the most interesting sagas.' It could stand as a credo for the entire Xeelee sequence. Baxter doesn't shrink from tackling the dismayingly inhuman implications of vast abysses of past or future time, but the universality of life introduces perspective, motion and plot into every part of his Stapledonian cosmological framework. It's great, heady, mind-bending stuff, meticulously mapped onto cutting edge speculations about the birth pangs of the universe and the ultimate fate of all known time and space, constantly enlivened and driven forward by the narratives that its vast range of life generates.

Baxter introduced the Xeelee Sequence in 1987 with his first published short story, 'The Xeelee Flower', and explored its entire timeline in two of the novels collected here, *Timelike Infinity* and *Ring*, and more than twenty short stories that were later linked and expanded into the novel *Vacuum Diagrams*. The other novels in this omnibus, *Raft* and *Flux*, are self-contained narratives islanded within the framework of the future history. *Raft* describes a civilisation founded by shipwrecked spacefarers who stumbled into an alternate universe where the gravitational constant is stronger; *Flux* is the story of microscopic inhabitants of a neutron star who discover that they are part of a grand but flawed scheme to attack the Xeelee's most ambitious project. A timeline at the end of this volume sets these works in their chronological context.

These early works fully embody Baxter's virtues: a swift narrative pace; transparent, uncluttered prose; vivid characters defined by action rather than introspection; and above all, accomplished and imaginative exploration, expansion and reworking of SF's core themes. His characters contest for living space with a panoply of bizarre aliens in a galaxy crammed with ancient wonders and secret histories; his stories reinvent the baroque excesses of space opera and brace them with imaginative exploration of ideas from stellar zoology, cosmology, quantum theory, exotic mathematics, and much else. Narratives froth with moments of shock and awe, and those sudden reversals of scale that induce the metaphysical dizziness sometimes called sense of wonder. Sentences stride confidently across centuries; paragraphs encompass millennia. Individual voices carry the story forwards, but the story is always bigger than the individuals who are caught up in it.

And these voices often have a distinctively British accent. Baxter's sympathies more often lie with chippy but doggedly competent scientists, engineers, and common soldiers than officers, self-made billionaires, or politicians of any stripe; there are overt references to Brunel and echoes of the history and equipage of the British Empire; and above all, his narratives are infused with the elegiac tone characteristic of British SF. While there's a constant sense of the indefatigable endurance of human spirit characteristic of genre narrative, it isn't the can-do optimism and frontier heroism of much American SF, but a calm and sober perspective that wryly acknowledges its small but significant place in the cosmological drama. In the long run, as Baxter's most enduring character, Michael Poole, discovers, time triumphs over all.

If you've read later novels and short stories in the Xeelee Sequence, you'll find that these early novels will deepen and broaden your understanding of its vast future history. Newcomers might want to read the stories collected in *Vacuum Diagrams* first: they provide a fine overview of the scope of this grandest of space operas. Okay. It's time to put away the programme.

Overture.

Curtain.

Lights . . .

Paul McAuley

London, May, 2009

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RAFT

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1

It was when the foundry imploded that Rees's curiosity about his world became unbearable. The shift started normally enough with a thump on his cabin wall from the fist of Sheen, his shift supervisor. Groggily, Rees pulled himself from his sleeping net and moved slowly about the jumbled cabin, grinding through his wake-up routines.

The water from the rusty spigot emerged reluctantly in the microgee conditions. The liquid was sour and cloudy. He forced down a few mouthfuls and splashed his face and hair. He wondered with a shudder how many human bodies this water had passed through since its first collection from a passing cloud; it had been dozens of shifts since the last supply tree from the Raft had called with fresh provisions, and the Belt's antique recycling system was showing its deficiencies.

He pulled on a stained, one-piece coverall. The garment was getting too short. At fifteen thousand shifts old he was dark, slim - and tall enough already and still growing, he thought gloomily. This observation made him think with a stab of sadness of his parents; it was just the sort of remark they might have made. His father, who had not long survived his mother, had died a few hundred shifts ago of circulatory problems and exhaustion. Suspended by one hand from the door frame Rees surveyed the little iron-walled cabin, recalling how cluttered it had seemed when he'd shared it with his parents.

He pushed such thoughts away and wriggled through the narrow door frame.

He blinked for a few seconds, dazzled by the shifting starlight . . . and hesitated. There was a faint scent on the air. A richness, like meat-sim. Something burning?

His cabin was connected to his neighbour's by a few yards of fraying rope and by lengths of rusty piping; he pulled himself a few feet along the rope and hung there, eyes raking the world around him for the source of the jarring scent.

The air of the Nebula was, as always, stained blood-red. A corner of his mind tried to measure that redness - was it deeper than last shift? - while his eyes flicked around the objects scattered through the Nebula above and below him. The clouds were like handfuls of greyish cloth sprinkled

through miles of air. Stars fell among and through the clouds in a slow, endless rain that tumbled down to the Core. The light of the mile-wide spheres cast shifting shadows over the clouds, the scattered trees, the huge blurs that might be whales. Here and there he saw a tiny flash that marked the end of a star's brief existence.

How many stars were there?

As a child Rees had hovered among the cables, eyes wide, counting up to the limits of his knowledge and patience. Now he suspected that the stars were without number, that there were more stars than hairs on his head . . . or thoughts in his mind, or words on his tongue. He raised his head and scoured a sky that was filled with stars. It was as if he were suspended in a great cloud of light; the star-spheres receded with distance into points of light, so that the sky itself was a curtain glowing red- yellow.

The burning scent called to him again, seeping through the thin air. He wrapped his toes in the cabin cable and released his hands; he let the spin of the Belt straighten his spine, and from this new viewpoint surveyed his home.

The Belt was a circle about eight hundred yards wide, a chain of battered dwellings and work places connected by ropes and tubes. At the centre of the Belt was the mine itself, a cooled- down star kernel fifty yards wide; lifting cables dangled from the Belt to the surface of the star kernel, scraping across the rusty meniscus at a few feet per second.

Here and there, fixed to the walls and roofs of the Belt, were the massive, white-metal mouths of jets; every few minutes a puff of steam emerged from one of those throats and the Belt tugged imperceptibly faster at his heels, shaking off the slowing effects of air friction. He studied the ragged rim of the nearest jet; it was fixed to his neighbour's roof and showed signs of hasty cutting and welding. As usual his attention drifted off into random speculation. What vessel, or other device, had that jet come from? Who were the men who had cut it away? And why had they come here . . . ?

Again the whiff of fire. He shook his head, trying to concentrate.

It was shift-change time, of course, and there were little knots of activity around most of the cabins in the Belt as workers, grimy and tired, made for their sleep nets - and, a quarter of the Belt's circumference from him, a haze of smoke hovered around the foundry. He saw men dive again and again

into the greyish fog. When they re-emerged they tugged limp, blackened forms.

Bodies?

With a soft cry he curled, grasped the rope and sprint-crawled over the diffuse gravity wells of cabin roofs and walls to the foundry.

He hesitated on the edge of the sphere of smoke. The stench of burnt meat-sim made his empty stomach twist. Two figures emerged from the haze, solidifying like figures in a dream. They carried an unrecognizable, bloodied bundle between them. Rees anchored himself and reached down to help them; he tried not to recoil as charred flesh peeled away in his hands.

The limp form was bundled in stained blankets and hauled tenderly away. One of the two rescuers straightened before Rees; white eyes shone out of a soot-smeared face. It took him a few seconds to recognize Sheen, his shift supervisor. The pull of her hot, blackened body was a distant tugging at his belly, and he was ashamed to find, even at a moment like this, his eyes tracking sweat droplets over her blood-smeared chest. ‘You’re late,’ she said, her voice smoke-deep as a man’s.

‘I’m sorry. What’s happened?’

‘An implosion. What do you think?’ Pushing scorched hair from her brow she turned and pointed into the stationary pall of smoke. Now Rees could make out the shape of the foundry within; its cubical form had buckled, as if crushed by a giant hand. ‘Two dead so far,’ Sheen said. ‘Damn it. That’s the third collapse in the last hundred shifts. If only Gord built strong enough for this damn stupid universe, I wouldn’t have to scrape my workmates off each other like so much spoiled meat-sim. Damn, damn.’

‘What shall I do?’

She turned and looked at him with annoyance; he felt a flush of embarrassment and fear climb in his cheeks. Her irritation seemed to soften a little. ‘Help us haul the rest out. Stick close to me and you’ll be fine. Try to breathe through your nose, OK?’

And she turned and dived back into the spreading smoke. Rees hesitated for a single second, then hurried after her.

The bodies were cleared and allowed to drift away into the Nebula air, while the injured were collected by their families and gently bundled to waiting cabins. The fire in the foundry was doused and soon the smoke was dispersing. Gord, the Belt’s chief engineer, crawled over the ruins. The

engineer was a short, blond man; he shook his head miserably as he began the work of planning the rebuilding of the foundry. Rees saw how the relatives of the dead and injured regarded Gord with hatred as he went about his work. Surely the series of implosions could not be blamed on the engineer?

. . . But if not Gord, who?

Rees's shift was cancelled. The Belt had a second foundry, separated from the ruin by a hundred and eighty degrees, and Rees would be expected to call there on his next working shift; but for now he was free.

He pulled his way slowly back to his cabin, staring with fascination at the blood-trails left by his hands on ropes and roofs. His head seemed still to be full of smoke. He paused for a few minutes at the entrance to his cabin, trying to suck clean oxygen from the air; but the ruddy, shifting starlight seemed almost as thick as smoke. Sometimes the Nebula breezes seemed almost unbreathable.

If only the sky were blue, he thought vaguely. I wonder what blue is like . . . Even in his parents' childhood - so his father had said - there were still hints of blue in the sky, off at the edges of the Nebula, far beyond the clouds and stars. He closed his eyes, trying to picture a colour he had never seen, thinking of coolness, of clear water.

So the world had changed since his father's day. Why? And would it change again? Would blue and those other cool colours return - or would the redness deepen until it was the colour of ruined flesh—

Rees pulled his way into his cabin and ran the spigot. He took off his tunic and scrubbed at his bloodstained skin until it ached.

The flesh peeled from the body in his hands like the skin from rotten fruit-sim; bone gleamed white—

He lay in his net, eyes wide, remembering.

A distant handbell rang three times. So it was still only mid-shift - he had to endure another shift and a half, a full twelve hours, before he had an excuse to leave the cabin.

If he stayed here he'd go crazy.

He rolled out of his net, pulled on his coverall and slid out of the cabin. The quickest way to the Quartermaster's was along the Belt past the wrecked foundry; deliberately he turned and crawled the other way.

People nodded from windows and outdoor nets as he passed, some smiling with faint sympathy. There were only a couple of hundred people in the Belt; the tragedy must have hit almost everybody. From dozens of cabins came the sounds of soft weeping, of cries of pain.

Rees lived alone, keeping mostly to his own company; but he *knew* almost everybody in the Belt. Now he lingered by cabins where people to whom he was a little closer must be suffering, perhaps dying; but he hurried on, feeling isolation thicken around him like smoke.

The Quartermaster's bar was one of the Belt's largest buildings at twenty yards across; it was laced with climbing ropes, and bar stock covered most of one wall. This shift the place was crowded: the stink of alcohol and weed, the bellow of voices, the pull of a mass of hot bodies - it all hit Rees as if he'd run into a wall. Jame, the barman, plied his trade briskly, laughing raucously through a greying tangle of beard. Rees lingered on the fringe of the milling crowd, anxious not to return to his desolate cabin; but the drink and laughter seemed to flow around him, excluding him, and he turned to leave.

'Rees! Wait . . .'

It was Sheen. She had pushed away from the centre of a group of men; one of them - a huge, intimidating miner called Roch - called after her drunkenly. Sheen's cheeks were moist from the heat of the bar and she had cropped away her scorched hair; otherwise she was bright and clean in a fresh, skimpy tunic. When she spoke her voice was still scoured rough by the smoke. 'I saw you come in. Here. You look like you need this.' She held out a drink in a tarnished globe.

Suddenly awkward, Rees said, 'I was going to leave—'

'I know you were.' She moved closer to him, unsmiling, and pushed the drink into his chest. 'Take it anyway.' Again he felt the pull of her body as a warmth in his stomach - why should her gravity field have such a distinct flavour from that of others? - and he was distractingly aware of her bare arms.

'Thanks.' He took the drink and sucked at the globe's plastic nipple; hot liquor coursed over his tongue. 'Maybe I did need that.'

Sheen studied him with frank curiosity. 'You're an odd one, Rees, aren't you?'

He stared back, letting his eyes slide over the smoothness of the skin around her eyes. It struck him that she wasn't really much older than he was. 'How am I odd?'

'You keep yourself to yourself.'

He shrugged.

'Look, it's something you need to grow out of. You need company. We all do. Especially after a shift like this one.'

'What did you mean earlier?' he asked suddenly.

'When?'

'During the implosion. You said how hard it was to build anything strong enough for this universe.'

'What about it?'

'Well . . . what other universe is there?'

She sucked at her drink, ignoring the shouted invitations from the party behind her. 'Who cares?'

'My father used to say the mine was killing us all. Humans weren't meant to work down there, crawling around in wheelchairs at five gee.'

She laughed. 'Rees, you're a character. But I'm not in the mood for metaphysical speculation, frankly. What I'm in the mood for is to get brain-dead on this fermented fruit-sim. So you can join me and the boys if you want, or you can go and sigh at the stars. OK?' She floated away, looking back questioningly; he shook his head, smiling stiffly, and she drifted back to her party, disappearing into a little pool of arms and legs.

Rees finished his drink, struggled to the bar to return the empty globe, and left.

A heavy cloud, fat with rain, drifted over the Belt, reducing visibility to a few yards; the air it brought with it seemed exceptionally sour and thin.

Rees prowled around the cables that girdled his world, muscles working restlessly. He completed two full circuits, passing huts and cabins familiar since his childhood, hurrying past well-known faces. The damp cloud, the thin air, the confinement of the Belt seemed to come together somewhere inside his chest. Questions chased around his skull. Why were human materials and building methods so inadequate to resist the forces of the world? Why were human bodies so feeble in the face of those forces?

Why had his parents had to die, without answering the questions that had haunted him since childhood?

Shards of rationality glittered in the mud of his overtired thinking. His parents had had no better understanding of their circumstances than he had; there had been nothing but legends they could tell him before their sour deaths. Children's tales of a Ship, a Crew, of something called Bolder's Ring . . . But his parents had had - acceptance. They, and the rest of the Belt dwellers - even the sparkiest, like Sheen - seemed implicitly to accept their lot. Only Rees seemed plagued by questions, unanswered doubts.

Why couldn't he be like everyone else? Why couldn't he just accept and be accepted?

He let himself drift to rest, arms aching, cloud mist spattering his face. In all his universe there was only one entity which he could talk to about this - which would respond in any meaningful way to his questions.

And that was a digging machine.

With a sudden impulse he looked about. He was perhaps a hundred yards from the nearest mine elevator station; his arms and legs carried him to it with renewed vigour.

Cloud mist swirled after Rees as he entered the station. The place was deserted, as Rees had expected. The whole shift would be lost to mourning; not for another two or three hours would the bleary-eyed workers of the next shift begin to arrive.

The station was little more than another cubical iron shack, locked into the Belt. It was dominated by a massive drum around which a fine cable was coiled. The drum was framed by winch equipment constructed of some metal that remained free of rust, and from the cable dangled a heavy chair fitted with large, fat wheels. The chair was topped by a head and neck support and was thickly padded. There was a control panel fixed to a strut at one end of the drum; the panel was an arm's-length square and contained fist-sized, colour-coded switches and dials. Rees rapidly set up a descent sequence on the panel and the winch drum began to vibrate.

He slid into the chair, taking care to smooth the clothing under his back and legs. On the surface of the star a crease of cloth could cut like a knife. A red light flashed on the control panel, casting sombre shadows, and the base of the cabin slid aside with a soft grind. The ancient machinery worked with a chorus of scrapes and squeaks; the drum turned and the cable began to pay out.

With a jolt Rees dropped through the station floor and into the dense cloud. The chair was pulled down the guide cable; the guide continued through the mist, he knew, for four hundred yards to the surface of the star. The familiar sensation of shifting gravity pulled at his stomach like gentle hands. The Belt was rotating a little faster than its orbital velocity - to keep the chain of cabins taut - and a few yards below the Belt the centripetal force faded, so that Rees drifted briefly through true weightlessness. Then he entered the gravity well of the star kernel and his weight built up rapidly, plating over his chest and stomach like iron.

Despite the mounting discomfort he felt a sense of release. He wondered what his workmates would think if they could see him now. To choose to descend to the mine during an off-shift . . . and what for? To talk to a digging machine?

The oval face of Sheen floated before him, intelligent, sceptical and pragmatic.

He felt a flush burn up through his cheeks and he was suddenly glad that his descent was hidden by the mist.

He dropped out of the mist and the star kernel was revealed. It was a porous ball of iron fifty yards wide, visibly scarred by the hands and the machines of men. The guide cable - and its siblings, spread evenly around the Belt - scraped along the iron equator at a speed of a few feet each second.

His descent slowed; he imagined the winch four hundred yards above him straining to hold him against the star’s clutching pull. Weight built up more rapidly now, climbing to its chest-crushing peak of five gees. The wheels of the chair began to rotate, whirring; then, cautiously, they kissed the moving iron surface. There was a bump which knocked the breath out of him. The cable disengaged rapidly, whipping backwards and away through the mist. The chair rolled slowly to a halt, carrying Rees a few yards from the trail of the cable.

For a few minutes Rees sat in the silence of the deserted star, allowing his breathing to adjust. His neck, back and legs all seemed comfortable in their deep padding, with no circulation-cutting folds of flesh or cloth. He lifted his right hand cautiously; it felt as if bands of iron encased his forearm, but he could reach the small control pad set into the chair arm.

He turned his head a few degrees to left and right. His chair sat isolated in the centre of an iron landscape. Thick rust covered the surface, scoured by valleys a few inches deep and pitted by tiny craters. The horizon was no more than a dozen yards away; it was as if he sat at the crest of a dome. The Belt, glimpsed through the layer of cloud around the star, was a chain of boxes rolling through the sky, its cables hauling the cabins and workshops through a full rotation every five minutes.

Rees had often worked through in his head the sequence of events which had brought this spectacle into being. The star must have reached the end of its active life many centuries earlier, leaving a slowly spinning core of white-hot metal. Islands of solid iron would have formed in that sea of heat, colliding and gradually coalescing. At last a skin must have congealed around the iron, thickening and cooling. In the process bubbles of air had been trapped, leaving the sphere riddled with caverns and tunnels - and so making it accessible to humans. Finally the oxygen-laden air of the Nebula had worked on the shining iron, coating it with a patina of brown oxide.

The star kernel was probably cold all the way to its centre by now, but Rees liked to imagine he could feel a faint glow of heat from the surface, the last ghost of star fire—

The silence was lanced through by a whine, far above him. Something glittering raced down through the air and hit the rust with a small impact a yard from Rees’s chair. It left a fresh crater a half-inch across; a wisp of steam struggled to rise against the star pull.

Now more of the little missiles fizzed through the air; the star rang with impacts.

Rain. Metamorphosed by its fall through a five-gee gravity well into a hail of steaming bullets.

Rees cursed and reached for his control panel. The chair rolled forward, each bump and valley in the landscape jarring the breath from him. He was a few yards still from the nearest entrance to the mine works. How could he have been so careless as to descend to the surface - alone - when there was danger of rain? The shower thickened, slamming into the surface all around him. He cringed, pinned to his chair, waiting for the shower to reach his head and exposed arms.

The mouth of the mine works was a long rectangle cut in the rust. His chair rolled with agonizing slowness down a shallow slope into the depths

of the star. At last the roof of the works was sliding over his head; the rain, safely excluded, spanged into the rust.

After pausing for a few minutes to allow his rattling heart to rest, Rees rolled on down the shallow, curving slope; Nebula light faded, to be replaced by the white glow of a chain of well-spaced lamps. Rees peered up at them as he passed. No one knew how the fist-sized globes worked. Apparently the lamps had glowed here unattended for centuries - most of them, anyway; here and there the chain was broken by the dimness of a failed lamp. Rees passed through the pools of darkness with a shudder; typically his mind raced through the years to a future in which miners would have to function without the ancient lamps.

After fifty yards of passageway - a third of the way around the circumference of the star - the light of the Nebula and the noise of the rain had disappeared. He reached a wide, cylindrical chamber, its roof about ten yards beneath the surface of the star. Rust-free walls gleamed in the lamplight. This was the entrance to the mine proper; the walls of the chamber were broken by the mouths of five circular passageways which led on into the heart of the star. The Moles - the digging machines - cut and refined the iron in the passageways, returning it in manageable nodules to the surface.

The real function of humans down here was to supplement the limited decision-making capabilities of the digging machines - to adjust their quota, perhaps, or to direct the gouging of fresh passageways around broken-down wheelchairs. Few people were capable of more . . . although some miners, like Roch, were full of drunken stories about their prowess under the extreme gravity conditions.

From one passageway came a grumbling, scraping sound. Rees turned the chair. After some minutes a blunt prow nosed into the light of the chamber, and - with painful slowness - one of the machines the miners called Moles worked its way over the lip of the tunnel.

The Mole was a cylinder of dull metal, some five yards long. It moved on six fat wheels. The prow of the Mole was studded with a series of cutting devices and with hand-like claws which worked the star iron. The machine’s back bore a wide pannier containing several nodules of freshly cut iron.

Rees snapped: ‘Status!’

The Mole rolled to a halt. It replied, as it always replied, ‘Massive sensor dysfunction.’ Its voice was thin and flat, and emanated from somewhere within its scuffed body.

Rees often imagined that if he knew what lay behind that brief report he would understand much of what baffled him about the world.

The Mole extended an arm from its nose. It reached to the panniers on its back and began lifting head-sized nodules down to a pile on the floor of the chamber. Rees watched it work for a few minutes. There were crude weld marks around the prow devices, the wheel axles and the points where the panniers were fixed; also, the skin of the Mole bore long, thin scars showing clearly where devices had been cut away, long ago. Rees half closed his eyes so that he could see only the broad cylindrical shape of the Mole. What might have been fixed to those scars on the hull? With a flash of insight he imagined the jets that maintained the Belt in its orbit attached to the Mole. In his mind the components moved around, assembling and reassembling in various degrees of implausibility. Could the jets really once have been attached to the Mole? Had it once been some kind of flying machine, adapted for work down here?

But perhaps other devices had been fixed to those scars - devices long since discarded and now beyond his imagination - perhaps the ‘sensors’ of which the Mole spoke.

He felt a surge of irrational gratitude to the Moles. In all his crushing universe they, enigmatic as they were, represented the only element of strangeness, of otherness; they were all his imagination had to work on. The first time he had begun to speculate that things might somewhere, sometime, be other than they were here had been a hundred shifts ago when a Mole had unexpectedly asked him whether he found the Nebula air any more difficult to breathe.

‘Mole,’ he said.

An articulated metal arm unfolded from the nose of the Mole; a camera fixed on him.

‘The sky looked a bit more red today.’

The transfer of nodules was not slowed but the small lens stayed steady. A red lamp somewhere on the prow of the machine began to pulse. ‘Please input spectrometer data.’

‘I don’t know what you’re talking about,’ Rees said. ‘And even if I did, I haven’t got a “spectrometer”.’

‘Please quantify input data.’

‘I still don’t understand,’ Rees said patiently.

For further seconds the machine studied him. ‘How red is the sky?’

Rees opened his mouth - and hesitated, stuck for words. ‘I don’t know. Red. Darker. Not as dark as blood.’

The lens lit up with a scarlet glow. ‘Please calibrate.’

Rees imagined himself to be staring into the sky. ‘No, not as bright as that.’

The glow scaled through a tight spectrum, through crimson to a muddy blood colour.

‘Back a little,’ Rees said. ‘. . . There. That’s it, I think.’

The lens darkened. The lamp on the prow, still scarlet, began to glow steady and bright. Rees was reminded of the warning light on the winch equipment and felt his flesh crawl under its blanket of weight. ‘Mole. What does that light mean?’

‘Warning,’ it said in its flat voice. ‘Deterioration of environment life-threatening. Access to support equipment recommended.’

Rees understood ‘threatening’, but what did the rest of it mean? What support equipment? ‘Damn you, Mole, what are we supposed to do?’

But the Mole had no reply; patiently it continued to unload its pannier.

Rees watched, thoughts racing. The events of the last few shifts came like pieces of a puzzle to the surface of his mind.

This was a tough universe for humans. The implosion had proved that. And now, if he understood any of what the Mole had said, it seemed that the redness of the sky was a portent of doom for them all, as if the Nebula itself were some vast, incomprehensible lamp of warning.

A sense of confinement returned, its weight more crushing than the pull of the star kernel. He would never get anyone else to understand his concerns. He was just some dumb kid, and his worries were based on hints, fragments, all partially understood.

Would he still be a kid when the end came?

Scenes of apocalypse flashed through his head: he imagined dimming stars, thickening clouds, the very air souring and failing in his lungs—

He had to get back to the surface, the Belt, and onwards; he had to find out more. And in all his universe there was only one place he could go.

The Raft. Somehow he had to get to the Raft.

With a new sense of purpose, vague but burning, he turned his chair to the exit ramp.

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2

The tree was a wheel of wood and foliage fifty yards wide. Its rotation slowing, it lowered itself reluctantly into the gravity well of the star kernel. Pallis, the tree-pilot, was hanging by hands and feet below the knotty trunk of the tree. The star kernel and its churning Belt mine were behind his back. With a critical eye he peered up through the mat of foliage at the smoke which hung raggedly over the upper branches. The layer of smoke wasn't anywhere near thick enough: he could clearly see starlight splashing through to bathe the tree's round leaves. He moved his hands along the nearest branch, felt the uncertain quivering of the fine blade of wood. Even here, at the root of the branches, he could feel the tree's turbulent uncertainty. Two imperatives acted on the tree. It strove to flee the deadly gravity well of the star - but it also sought to escape the shadow of the smoke cloud, which drove it back into the well. A skilful woodsman should have the two imperatives in fine balance; the tree should hover in an unstable equilibrium at the required distance.

Now the tree's rotating branches bit into the air and it jerked upwards by a good yard. Pallis was almost shaken loose. A cloud of skitters came tumbling from the foliage; the tiny wheel-shaped creatures buzzed around his face and arms as they tried to regain the security of their parent.

Damn that boy—

With an angry, liquid movement of his arms he hauled himself through the foliage to the top side of the tree. The ragged blanket of smoke and steam hung a few yards above his head, attached tenuously to the branches by threads of smoke. The damp wood in at least half the fire bowls fixed to the branches had, he soon found, been consumed.

And Gover, his so-called assistant, was nowhere to be seen.

His toes wrapped around the foliage, Pallis drew himself to his full height. At fifty thousand shifts he was old by Nebula standards; but his stomach was still as flat and as hard as the trunk of one of his beloved fleet of trees, and most men would shy from the network of branch scars that covered his face, forearms and hands and flared red at moments of anger.

And this was one of those moments.

'Gover! By the Bones themselves, what do you think you are doing?'

A thin, clever face appeared above one of the bowls near the rim of the tree. Gover shook his way out of a nest of leaves and came scurrying across the platform of foliage, a pack bouncing against his narrow back.

Pallis stood with arms folded and biceps bunched. ‘Gover’, he said softly, ‘I’ll ask you again. What do you think you’re doing?’

Gover shoved the back of his hand against his nose, pushing the nostrils out of shape; the hand came away glistening. ‘I’d finished,’ he mumbled.

Pallis leant over him. Gover’s gaze slid over and away from the tree-pilot’s eyes. ‘You’re finished when I tell you so. And not before.’

Gover said nothing.

‘Look—’ Pallis stabbed a finger at Gover’s pack. ‘You’re still carrying half your stock of wood. The fires are dying. And look at the state of the smoke screen. More holes than your damn vest. My tree doesn’t know whether she’s coming or going, thanks to you. Can’t you feel her shuddering?

‘Now, listen, Gover. I don’t care a damn for you, but I do care for my tree. You cause her any more upset and I’ll have you over the rim; if you’re lucky the Boneys’ll have you for supper, and I’ll fly her home to the Raft myself. Got that?’

Gover hung before him, hands tugging listlessly at the ragged hem of his vest. Pallis let the moment stretch taut; then he hissed, ‘Now move it!’

With a flurry of motion Gover pulled himself to the nearest pot and began hauling wood from his pack. Soon fresh billows of smoke were rising to join the depleted cloud, and the shuddering of the tree subsided.

His exasperation simmering, Pallis watched the boy’s awkward movements. Oh, he’d had his share of poor assistants in the past, but in the old times most of them had been willing to learn. To try. And gradually, as hard shifts wore by, those young people had grown into responsible men and women, their minds toughening with their bodies.

But not this lot. Not the new generation.

This was his third flight with the boy Gover. And the lad was still as sullen and obstructive as when he’d first been assigned to the trees; Pallis would be more than glad to hand him back to Science.

His eyes roamed around the red sky, restless. The falling stars were an array of pinpoints dwindling into the far distance; the depths of the Nebula, far below him, were a sink of murky crimson. Was this nostalgic disregard

for the young of today just a symptom of ageing . . . ? Or had people truly changed?

Well, there was no doubt that the world had changed around him. The crisp blue skies, the rich breezes of his youth were memories now; the very air was turning into a smoky sludge, and the minds of men seemed to be turning sour with it.

And one thing was for sure. His trees didn't like this gloom.

He sighed, trying to snap out of his introspection. The stars kept falling no matter what the colour of the sky. Life went on, and he had work to do.

Tiny vibrations played over the soles of his bare feet, telling him that the tree was almost stable now, hovering at the lip of the star kernel's gravity well. Gover moved silently among the fire bowls. Damn it, the lad could do the job well when he was forced to. That was the most annoying thing about him. 'Right, Gover, I want that layer maintained while I'm off-tree. And the Belt's a small place; I'll know if you slack. You got that?'

Gover nodded without looking at him.

Pallis dropped through the foliage, his thoughts turning to the difficult negotiations ahead.

It was the end of Rees's work shift. Wearily he hauled himself through the foundry door.

Cooler air dried the sweat from his brow. He pulled himself along the ropes and roofs towards his cabin, inspecting his hands and arms with some interest. When one of the older workers had dropped a ladle of iron, Rees had narrowly dodged a hail of molten metal; tiny droplets had drifted into his flesh, sizzling out little craters which—

A huge shadow flapped across the Belt. Air washed over his back. He looked up; and a feeling of astonishing cold settled at the base of his skull.

The tree was magnificent against the crimson sky. Its dozen radial branches and their veil of leaves turned with a calm possession; the trunk was like a mighty wooden skull which glared around at the ocean of air.

This was it. His opportunity to escape from the Belt . . .

The supply trees were the only known means of travelling from Belt to Raft, and so after his moment of decision following the foundry implosion Rees had resolved to stow away on the next tree to visit the Belt. He had begun to hoard food, wrapping dried meat in bundles of cloth, filling cloth globes with water—

Sometimes, during his sleep shifts, he had lain awake staring at his makeshift preparations and a thin sweat had covered his brow as he wondered if he would have the courage to take the decisive step.

Well, the moment had come. Staring at the magnificent tree he probed his emotions: he knew he was no hero, and he had half expected fear to encase him like a net of ropes. But there was no fear. Even the nagging pain in his hands subsided. There was only elation; the future was an empty sky, within which his hopes would surely find room.

He hurried to his cabin and collected his bundle of supplies, which was already lashed together; then he climbed to the outer wall of his cabin.

A rope had uncoiled from the tree trunk and lay across the fifty yards to the Belt, brushing against the orbiting cabins. A man came shimmering confidently down the rope; he was scarred, old and muscular, almost a piece of the tree himself. Ignoring the watching Rees the man dropped without hesitation across empty air to a cabin and began to make his way around the Belt.

Rees clung to his cabin by one hand. The rotation of the Belt carried the cabin steadily towards the tree's dangling rope; when it was a yard from him he grabbed at it and swarmed without hesitation off the Belt.

As always at shift change the Quartermaster's was crowded. Pallis waited outside, watching the Belt's pipes and boxy cabins roll around the star kernel. At length Sheen emerged bearing two drink globes.

They drifted to the relative privacy of a long stretch of piping and silently raised their globes. Their eyes met briefly. Pallis looked away in some confusion - then felt embarrassed at that in turn.

To the Bones with it. The past was gone.

He sucked at the liquor, trying not to grimace. 'I think this stuff's improving,' he said at last.

Her eyebrows arched slightly. 'I'm sorry we can't do better. No doubt your tastes are a little more refined.'

He felt a sigh escape from his throat. 'Damn it, Sheen, let's not fence. Yes, the Raft has got a liquor machine. Yes, what comes out of it is a damn sight finer than this recycled piss. And everyone knows it. But this stuff really is a little better than it was. All right? Now, can we get on with our business?'

She shrugged, indifferent, and sipped her drink. He studied the way the diffuse light caught in her hair, and his attraction to her once more pulled at him. Damn it, he had to grow out of this. It must be five thousand shifts since the time they'd slept together, their limbs tangling in her sleeping net as the Belt rolled silently around its star . . .

It had been a one-off, two tired people falling together. Now, damn it to hell, it only got in the way of business. In fact he suspected the miners used her as their negotiating front with him knowing the effect she had on him. This was a tough game. And it was getting tougher . . .

He tried to concentrate on what she was saying. '. . . So we're down on production. We can't fulfil the shipment. Gord says it will take another fifty shifts before that foundry is operational again. And that's the way it is.' She fell silent and stared at him defiantly.

His eyes slid from her face and tracked reluctantly around the Belt. The ruined foundry was a scorched, crumpled wound in the chain of cabins. Briefly he allowed himself to imagine the scene in there during the accident - the walls bellying in, the ladles spilling molten iron—

He shuddered.

'I'm sorry, Sheen,' he said slowly. 'I truly am. But—'

'But you're not going to leave us the full fee,' she said sourly.

'Damn it, I don't make the rules. I've a treeful of supplies up there; I'm ready to give you what I get back in iron, at the agreed exchange rate.'

She hissed through clenched teeth, her eyes fixed on her drink. 'Pallis, I hate to beg. You've no idea how much I hate to beg. But we need those supplies. We've got sewage coming out of our spigots; we've got sick and dying—'

He gulped down the last of his drink. 'Leave it, Sheen,' he said, more harshly than he'd intended.

She raised her head and fixed him with eyes reduced to slits. 'You need our metal, Raft man. Don't forget that.'

He took a deep breath. 'Sheen, we've another source. You know that. The early Crew found two star kernels in neat circular orbits around the Core—'

She laughed quietly. 'And you know the other mine isn't producing any more. Is it, Pallis? We don't know what happened to it, yet, but we've picked up that much. So let's not play games.'

Shame rose like a bubble inside him; he felt his face redden and he imagined his scars emerging as a livid net. So they knew. At least, he reflected gloomily, at least we evacuated the Nebula's only other mine when that star fell too close. At least we were honourable enough for that. Although not honourable enough to avoid lying about all that pain in order to keep our advantage over these people—

'Sheen, we're getting nowhere. I'm just doing my job, and this is out of my control.' He handed back his drink globe. 'You have a shift to decide whether to accept my terms. Then I leave regardless. And - look, Sheen, just remember something. We can recycle our iron a hell of a lot easier than you can recycle your food and water.'

She studied him dispassionately. 'I hope they suck on your bones, Raft man.' He felt his shoulders slump. He turned and began to make his slow way to the nearest wall, from which he could jump to the tree rope.

A file of miners clambered up to the tree, iron plates strapped to their backs. Under the pilot's supervision the plates were lashed securely to the tree rim, widely spaced. The miners descended to the Belt laden with casks of food and fresh water.

Rees, watching from the foliage, couldn't understand why so many of the food cases were left behind in the tree.

He stayed curled closely around a two-feet-wide branch - taking care not to cut open his palms on its knife-sharp leading edge - and he kept a layer of foliage around his body. He had no way of telling the time, but the loading of the tree must have taken several shifts. He was wide-eyed and sleepless. He knew that his absence from work would go unremarked for at least a couple of shifts - and, he thought with a distant sadness, it might be longer before anyone cared enough to come looking for him.

Well, the world of the Belt was behind him now. Whatever dangers the future held for him, at least they would be new dangers.

In fact he only had two problems. Hunger and thirst . . .

Disaster had struck soon after he had found himself this hiding place among the leaves. One of the Belt workmen had stumbled across his tiny cache of supplies; thinking it belonged to the despised Raft crewmen the miner had shared the morsels among his companions. Rees had been lucky to avoid detection himself, he realized . . . but now he had no supplies, and the clamour of his throat and belly had come to fill his head.

But at last the loading was complete; and when the pilot launched his tree, even Rees's thirst was forgotten.

When the final miner had slithered down to the Belt, Pallis curled up the rope and hung it around a hook fixed to the trunk. So his visit was over. Sheen hadn't spoken to him again, and for several shifts he had had to endure the sullen silence of strangers. He shook his head and turned his thoughts with some relief to the flight home. 'Right, Gover, let's see you move! I want the bowls switched to the underside of the tree, filled and lit before I've finished coiling this rope. Or would you rather wait for the next tree?'

Gover got to work, comparatively briskly; and soon a blanket of smoke was spreading beneath the tree, shielding the Belt and its star from view.

Pallis stood close to the trunk, his feet and hands sensitive to the excited surge of sap. It was almost as if he could sense the huge vegetable thoughts of the tree as it reacted to the darkness spreading below it. The trunk audibly hummed; the branches bit into the air; the foliage shook and swished and skitters tumbled, confused at the abrupt change of airspeed; and then, with an exhilarating surge, the great spinning platform lifted from the star. The Belt and its human misery dwindled to a toy-like mote, falling slowly into the Nebula, and Pallis, hands and feet pressed against the flying wood, was where he was most happy.

His contentment lasted for about a shift and a half. He prowled the wooden platform, moodily watching the stars slide through the silent air. The flight just wasn't smooth. Oh, it wasn't enough to disturb Gover's extensive slumbers, but to Pallis's practised senses it was like riding a skitter in a gale. He pressed his ear to the ten-feet-high wall of the trunk; he could feel the bole whirring in its vacuum chamber as it tried to even out the tree's rotation.

This felt like a loading imbalance . . . But that was impossible. He'd supervised the stowage of the cargo himself to ensure an even distribution of mass around the rim. For him not to have spotted such a gross imbalance would have been like - well, like forgetting to breathe.

Then what?

With a growl of impatience he pushed away from the trunk and stalked to the rim. He began to work around the lashed loads, methodically

rechecking each plate and cask and allowing a picture of the tree's loading to build up in his mind—

He slowed to a halt. One of the food casks had been broken into; its plastic casing was cracked in two places and half the contents were gone. Hurriedly he checked a nearby water cask. It too was broken open and empty.

He felt hot breath course through his nostrils. 'Gover! Gover, come here!'

The boy came slowly, his thin face twisted with apprehension.

Pallis stood immobile until Gover got within arm's reach; then he lashed out with his right hand and grabbed the apprentice's shoulder. The boy gasped and squirmed, but was unable to break the grip. Pallis pointed at the violated casks. 'What do you call this?'

Gover stared at the casks with what looked like real shock. 'Well, I didn't do it, pilot. I wouldn't be so stupid - ah!'

Pallis worked his thumb deeper into the boy's joint, searching for the nerve. 'Did I keep this food from the miners in order to allow you to feast your useless face? Why, you little bonesucker, I've a mind to throw you over now. When I get back to the Raft I'll make sure not a day of your life goes by without the world being told what a lying, thieving . . . little . . .'

Then he fell silent, his anger dissipating.

There was still something wrong. The mass of the provisions taken from the casks wasn't nearly enough to account for the disruption to the tree's balance. And as for Gover - well, he'd been proven a thief, a liar and worse in the past, but he was right: he wasn't nearly stupid enough for this.

Reluctantly he released the boy's shoulder. Gover rubbed the joint, staring at him resentfully. Pallis scratched his chin. 'Well, if you didn't take the stuff, Gover, then who did? Eh?'

By the Bones, they had a stowaway.

Swiftly he dropped to all fours and pressed his hands and feet against the wood of a branch. He closed his eyes and let the tiny shuddering speak to him. If the unevenness wasn't at the rim then where . . . ?

Abruptly he straightened and half ran about a quarter of the way around the rim, his long toes clutching at the foliage. He paused for a few seconds, hands once more folded around a branch; then he made his way more slowly towards the centre of the tree, stopping about halfway to the trunk.

There was a little nest in the foliage. Through the bunched leaves he could see a few scraps of discoloured cloth, a twist of unruly black hair, a hand dangling weightless; the hand was that of a boy or young man, he judged, but it was heavily callused and it bore a spatter of tiny wounds.

Pallis straightened to his full height. ‘Well, here’s our unexpected mass, apprentice. Good shift to you, sir! And would you care for your breakfast now?’

The nest exploded. Skitters whirled away from the tangle of limbs and flew away, as if indignant; and at last a boy half-stood before Pallis, eyes bleary with sleep, mouth a circle of shock.

Gover sidled up beside Pallis. ‘By the Bones, it’s a mine rat.’

Pallis looked from one boy to the other. The two seemed about the same age, but where Gover was well-fed and ill-muscled, the stowaway had ribs like an anatomical model’s and his muscles were like a man’s; and his hands were the battered product of hours of labour. The lad’s eyes were dark-ringed. Pallis remembered the imploded foundry and wondered what horrors this young miner had already seen. Now the boy filled his chest defiantly, his hands bunching into fists.

Gover sneered, arms folded. ‘What do we do, pilot? Throw him to the Boneys?’

Pallis turned on him with a snarl. ‘Gover, sometimes you disgust me.’

Gover flinched. ‘But—’

‘Have you cleaned out the fire bowls yet? No? Then do it. Now!’

With a last, baleful glare at the stowaway, Gover moved clumsily away across the tree.

The stowaway watched him go with some relief; then turned back to Pallis.

The pilot’s anger was gone. He raised his hands, palms upwards. ‘Take it easy. I’m not going to hurt you . . . and that idler is nothing to be afraid of. Tell me your name.’

The boy’s mouth worked but no sound emerged; he licked cracked lips, and managed to say: ‘Rees.’

‘All right. I’m Pallis. I’m the tree-pilot. Do you know what that means?’

‘I . . . Yes.’

‘By the Bones, you’re dry, aren’t you? No wonder you stole that water. You did, didn’t you? And the food?’

The boy nodded hesitantly. ‘I’m sorry. I’ll pay you back—’

‘When? After you return to the Belt?’

The boy shook his head, a glint in his eye. ‘No. I’m not going back.’

Pallis bunched his fists and rested them on his hips. ‘Listen to me. You’ll have to go back. You’ll be allowed to stay on the Raft until the next supply tree; but then you’ll be shipped back. You’ll have to work your passage, I expect. All right?’

Rees shook his head again, his face a mask of determination.

Palls studied the young miner, an unwelcome sympathy growing inside him. ‘You’re still hungry, aren’t you? And thirsty, I’ll bet. Come on. I keep my - and Gover’s - rations at the trunk.’

He led the boy across the tree surface. Surreptitiously he watched as the boy half walked across the foliated platform, his feet seeking out the points of good purchase and then lodging in the foliage, so allowing him to ‘stand’ on the tree. The contrast with Gover’s clumsy stumbling was marked. Pallis found himself wondering what kind of woodsman the lad would make . . .

After a dozen yards they disturbed a spray of skitters; the little creatures whirled up into Rees’s face and he stepped back, startled. Pallis laughed. ‘Don’t worry. Skitters are harmless. They are the seeds from which the tree grows . . .’

Rees nodded. ‘I guessed that.’

Pallis arched an eyebrow. ‘You did?’

‘Yes. You can see the shape’s the same; it’s just a difference of scale.’

Pallis listened in surprised silence to the serious, parched voice.

They reached the trunk. Rees stood before the tall cylinder and ran his fingers over the gnarled wood. Pallis hid a smile. ‘Put your ear against the wood. Go on.’

Rees did so with a look of puzzlement - which evolved into an almost comic delight.

‘That’s the bole turning, inside the trunk. You see, the tree is alive, right to its core.’

Rees’s eyes were wide.

Now Pallis smiled openly. ‘But I suspect you won’t be alive much longer if you don’t eat and drink. Here . . .’

After letting the boy sleep for a quarter-shift Pallis put him to work. Soon Rees was bent over a fire bowl, scraping ash and soot from the iron

with shaped blades of wood. Pallis found that his work was fast and complete, supervised or unsupervised. Once again Gover suffered by comparison . . . and by the looks he shot at Rees, Pallis suspected Gover knew it.

After half a shift Pallis brought Rees a globe of water. ‘Here; you deserve a break.’

Rees squatted back among the foliage, flexing stiff hands. His face was muddy with sweat and soot and he sucked gratefully at the drink. On an impulse Pallis said, ‘These bowls hold fire. Maybe you guessed that. Do you understand how they’re used?’

Rees shook his head, interest illuminating his tired face.

Pallis described the simple sensorium of the tree. The tree was essentially a huge propeller. The great vegetable reacted to two basic forms of stimuli - gravity fields and light - and in their uncultivated state great forests of trees of all sizes and ages would drift through the clouds of the Nebula, their leaves and branchlets trapping starlight, the nourishment of drifting plants and animals, the moisture of fat rain clouds.

Rees listened, nodding seriously. ‘So by rotating faster - or slower - the tree pushes at the air and can climb away from gravity wells or towards the light.’

‘That’s right. The art of the pilot is to generate a blanket of smoke to hide the light, and so to guide the flight of the tree.’

Rees frowned, his eyes distant. ‘But what I don’t understand is how the tree can change its rotation speed.’

Once again Pallis was surprised. ‘You ask good questions,’ he said slowly. ‘I’ll try to explain. The trunk is a hollow cylinder; it contains another, solid cylinder called the bole, which is suspended in a vacuum chamber. The trunk and the rest of the tree are made of a light, fine-fibred wood; but the bole is a mass of much denser material, and the vacuum chamber is crisscrossed with struts and ribs to keep it from collapsing. And the bole spins in its chamber; muscle-like fibres keep it whirling faster than a skitter.

‘Now - when the tree wants to speed its rotation it slows the bole a little, and the spin of the bole is transferred to the tree. And when the tree wants to slow it is as if it pours some of its spin back into the bole.’ He struggled for phrases to make it clearer; dim, half-understood fragments from

Scientists' lectures drifted through his mind: moments of inertia, conservation of angular momentum . . .

He gave up with a shrug. 'Well, that's about the best I can explain it. Do you understand?'

Rees nodded. 'I think so.' He looked oddly pleased with Pallis's answer; it was a look that reminded the pilot of the Scientists he had worked with, a look of pleasure at finding out how things work.

Gover, from the rim of the tree, watched them sullenly.

Pallis stepped slowly back to his station at the trunk. How much education did the average miner get? He doubted Rees was even literate. As soon as a child was strong enough he was no doubt forced into the foundry or down to the crushing surface of the iron star, to begin a life of muscle-sapping toil . . .

And he was forced there by the economics of the Nebula, he reminded himself harshly; economics which he - Pallis - helped to keep in place.

He shook his head, troubled. Pallis had never accepted the theory, common on the Raft, that the miners were a species of subhuman, fit only for the toil they endured. What was the life span of the miners? Thirty thousand shifts? Less, maybe? Would Rees live long enough to learn what angular momentum was? What a fine woodsman he would make . . . or, he admitted ruefully, maybe a better Scientist.

A vague plan began to form in his mind.

Rees came to the trunk and collected his shift-end rations. The young miner peered absently around at the empty sky. As the tree climbed up towards the Raft, away from the Core and towards the edge of the Nebula, the air was perceptibly brightening.

A distant sound carried over the sigh of the wind through the branches: a discordant shout, huge and mysterious.

Rees looked questioningly at Pallis. The tree-pilot smiled. 'That's the song of a whale.' Rees looked about eagerly, but Pallis warned, 'I wouldn't bother. The beast could be miles away . . .' The pilot watched Rees thoughtfully. 'Rees, something you haven't told me yet. You're a stowaway, right? But you can't have any real idea what the Raft is like. So . . . why did you do it? What were you running from?'

Rees's brow creased as he considered the question. 'I wasn't running from anything, pilot. The mine is a tough place, but it was my home. No. I

left to find the answer.’

‘The answer? To what?’

‘To why the Nebula is dying.’

Pallis studied the serious young miner and felt a chill settle on his spine.

Rees woke from a comfortable sleep in his nest of foliage. Pallis hung over him, silhouetted by a bright sky. ‘Shift change,’ the pilot said briskly. ‘Hard work ahead for all of us: docking and unloading and—’

‘Docking?’ Rees shook his head clear of sleep. ‘Then we’ve arrived?’

Pallis grinned. ‘Well, isn’t that obvious?’

He moved aside. Behind him the Raft hung huge in the sky.

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Hollerbach lifted his head from the lab report, eyes smarting. He removed his spectacles, set them on the desk top before him, and began methodically to massage the ridge of bone between his eyes. ‘Oh, do sit down, Mith,’ he said wearily.

Captain Mith continued to pace around the office. His face was a well of anger under its covering of black beard and his massive belly wobbled before him. Hollerbach noted that Mith’s coverall was frayed at the hem, and even the golden Officer’s threads at his collar looked dulled. ‘Sit down? How the hell can I sit down? I suppose you know I’ve got a Raft to run.’

Hollerbach groaned inwardly. ‘Of course, but—’

Mith took an orrery from a crowded shelf and shook it at Hollerbach. ‘And while you Scientists swan around in here my people are sick and dying—’

‘Oh, by the Bones, Mith, spare me the sanctimony!’ Hollerbach thrust out his jaw. ‘Your father was just the same. All lectures and no damn use.’

Mith’s mouth was round. ‘Now, look, Hollerbach—’

‘Lab tests take time. The equipment we’re working with is hundreds of thousands of shifts old, remember. We’re doing our best, and all the bluster in the Nebula isn’t going to speed us up. And you can put down that orrery, if you don’t mind.’

Mith looked at the dusty instrument. ‘Why the hell should I, you old fart?’

‘Because it’s the only one in the universe. And nobody knows how to fix it. Old fart yourself.’

Mith growled - then barked laughter. ‘All right, all right.’ He set the orrery back on its shelf and pulled a hard-backed chair opposite the desk. He sat with legs splayed under his belly and raised troubled eyes to Hollerbach. ‘Look, Scientist, we shouldn’t be scrapping. You have to understand how worried I am, how frightened the crew are.’

Hollerbach spread his hands on the desk top; liver-spots stared back at him. ‘Of course I do, Captain.’ He turned his ancient spectacles over in his fingers and sighed. ‘Look, we don’t need to wait for the lab results. I know damn well what we’re going to find.’

Mith spread his hands palm up. ‘What?’

‘We’re suffering from protein and vitamin deficiencies. The children particularly are being hit by bone, skin and growth disorders so archaic that the Ship’s medical printouts don’t even refer to them.’ He thought of his own grandchild, not four thousand shifts old; when Hollerbach took those slim little legs in his hands he could feel the bones curve . . . ‘Now, we don’t think there’s anything wrong with the food dispensers.’

Mith snorted. ‘How can you be so sure?’

Hollerbach rubbed his eyes again. ‘Of course I’m not sure,’ he said, irritated. ‘Look, Mith, I’m speculating. You can either accept that or wait for the tests.’

Mith sat back and held up his palms. ‘All right, all right. Go on.’

‘Very well, then. Of all the Raft’s equipment our understanding is, by necessity, greatest of the dispensers. We’re overhauling the brutes; but I don’t expect anything to be found wrong.’

‘What, then?’

Hollerbach climbed out of his chair, feeling the familiar twinge in his right hip. He walked to the open door of his office and peered out. ‘Isn’t it obvious? Mith, when I was a kid that sky was blue as a baby’s eyes. Now we have children, adults even, who don’t know what blue is. The damn Nebula has gone sour. The dispensers are fed by organic compounds in the Nebula atmosphere - and by airborne plants and animals, of course. Mith, it’s a case of garbage in, garbage out. The machines can’t work miracles. They can’t produce decent food out of the sludge out there. And that’s the problem.’

Behind him Mith was silent for a long time. Then he said, ‘What can we do?’

‘Beats me,’ said Hollerbach, a little harshly. ‘You’re the Captain.’

Mith got out of his chair and lumbered up to Hollerbach; his breath was hot on the old Scientist’s neck, and Hollerbach could feel the pull of the Captain’s weighty gut. ‘Damn it, stop patronizing me. What am I supposed to tell the crew?’

Abruptly, Hollerbach felt very tired. He reached with one hand for the door frame and wished his chair weren’t so far away. ‘Tell them not to give up hope,’ he said quietly. ‘Tell them we’re doing all we know how to do. Or tell them nothing. As you see fit.’

Mith thought it over. ‘Of course, not all your results are in.’ There was a trace of hope in his voice. ‘And you haven’t completed that machine overhaul, have you?’

Hollerbach shook his head, eyes closed. ‘No, we haven’t finished the overhaul.’ ‘So maybe there’s something wrong with the machines after all.’ Mith clapped his shoulder with a plate-sized hand. ‘All right, Hollerbach. Thanks. Look, keep me informed.’

Hollerbach stiffened. ‘Of course.’

Hollerbach watched Mith stride away across the deck, his belly oscillating. Mith wasn’t too bright - but he was a good man. Not as good as his father, maybe, but a lot better than some of those who were now calling for his replacement.

Maybe a cheerful buffoon was right for the Raft in its present straits. Someone to keep their spirits up as the air turned to poison—

He laughed at himself. Come on, Hollerbach; you really are turning into an old fart.

He became aware of a prickling over his bald pate; he glared up at the sky. That star overhead was a searing pinpoint, its complex orbit bringing it ever closer to the path of the Raft. Close enough to burn the skin, eh? He couldn’t remember a star being allowed to fall so threateningly close before; the Raft should have been shifted long since. He’d have to get on to Navigator Cipse and his boys. He couldn’t think what they were playing at.

Now a shadow swept across him, and he made out the silhouette of a tree rotating grandly far above the Raft. That would be Pallis, returning from the Belt. Another good man, Pallis . . . one of the few left.

He dropped his prickling eyes and studied the deck plates beneath his feet. He thought of the human lives that had been expended on keeping this little metal island afloat in the air for so long. And was it only to come to this, a final few generations of sour sullenness, falling at last to the poisoned air?

Maybe it would be better not to move the Raft out from under that star. Let it all go up in one last blaze of human glory—

‘Sir?’ Grye, one of his assistants, stood before him; the little round man nervously held out a battered sheaf of paper. ‘We’ve finished another test run.’

So there was still work to do. ‘Well, don’t stand about like that, man; if you’re no use you’re certainly no ornament. Bring that in and tell me what it says.’

And he turned and led the way into his office.

The Raft had grown in the sky until it blocked out half the Nebula. A star was poised some tens of miles above the Raft, a turbulent ball of yellow fire a mile wide, and the Raft cast a broadening shadow down through miles of dusty air.

Under Pallis’s direction Rees and Gover stoked the fire bowls and worked their way across the surface of the tree, waving large, light blankets over the billowing smoke. Pallis studied the canopy of smoke with a critical eye; never satisfied, he snapped and growled at the boys. But, steadily and surely, the tree’s rise through the Nebula was moulded into a slow curve towards the Rim of the Raft.

As he worked, Rees chanced the wrath of Pallis by drinking in the emergent details of the Raft. From below it showed as a ragged disc a half-mile wide; metal plates scattered highlights from the stars and light leaked through dozens of apertures in the deck. As the tree sailed up to the Rim the Raft foreshortened into a patchwork ellipse; Rees could see the sooty scars of welding around the edges of the nearer plates, and as his eye tracked across the ceiling-like surface the plates crowded into a blur, with the far side of the disc a level horizon.

At last, with a rush of air, the tree rose above the Rim and the upper surface of the Raft began to open out before Rees. Against his will he found himself drawn to the edge of the tree; he buried his hands in the foliage and stared, openmouthed, as a torrent of colour, noise and movement broke over him.

The Raft was an enormous dish that brimmed with life. Points of light were sprinkled over its surface like sugar-sim over a confectionery. The deck was studded with buildings of all shapes and sizes, constructed of wood panels or corrugated metal and jumbled together like toys. All around the Rim, machines as tall as two men hulked like silent guardians; and at the heart of the Raft lay a huge silver cylinder, stranded like a trapped whale among the box-like constructions.

A confusion of smells assaulted Rees’s senses - sharp ozone from the Rim machines and other workshops and factories, woodsmoke from a

thousand chimneys, the hint of exotic cooking scents from the cabins.

And people - more than Rees could count, so many that the Belt population would be easily lost among them - people walked about the Raft in great streams; and knots of running children exploded here and there into bursts of laughter.

He made out sturdy pyramids fixed to the deck, no more than waist high. Rees squinted, scanning the deck; the pyramids stood everywhere. He saw a couple lingering beside one, talking quietly, the man scuffing the metal cone with one foot; and there a group of children chased through a series of the pyramids in a complicated game of catch.

And out of each pyramid a cable soared straight upwards; Rees tilted his face back, following the line of the cables, and he gasped.

To each cable was tethered the trunk of a tree.

To Rees, one flying tree had been wonder enough. Now, over the Raft, he was faced with a mighty forest. Every tethering cable was vertical and quite taut, and Rees could almost feel the exertion of the harnessed trees as they strained against the pull of the Core. The light of the Nebula was filtered by its passage through the rotating ranks of trees, so that the deck of the Raft was immersed in a soothing gloom; around the forest dancing skitters softened the light to pastel pink.

Rees's tree rose until it passed the highest layer of the forest. The Raft turned from a landscape back into an island in the air, crowned by a mass of shifting foliage. The sky above Rees seemed darker than usual, so that he felt he was suspended at the very edge of the Nebula, looking down over the mists surrounding the Core; and in all that universe of air the only sign of humanity was the Raft, a scrap of metal suspended in miles of air.

There was a heavy hand on his shoulder. Rees started. Pallis stood over him, the canopy of smoke a backdrop to his stern face. 'What's the matter?' he growled. 'Never seen a few thousand trees before?'

Rees felt himself flush. 'I . . .'

But Pallis was grinning through his scars. 'Listen, I understand. Most people take it all for granted. But every time I see it from outside - it gives me a kind of tingle.' A hundred questions tumbled through Rees's mind. What would it be like to walk on that surface? What must it have been like to build the Raft, hanging in the void above the Core?

But now wasn't the time; there was work to do. He got to his feet, wrapping his toes in the foliage like a regular woodsman.

'Now then, miner,' Pallis said, 'we've got a tree to fly. We have to drop back into that forest. Let's get the bowls brimming; I want a canopy up there so thick I could walk about on it. All right?'

At last Pallis seemed satisfied with the tree's position over the Raft. 'All right, lads. Now!'

Gover and Rees ran among the fire bowls, shoving handfuls of damp wood into the flames. Smoke rolled up to the canopy above them. Gover coughed as he worked, swearing; Rees found his eyes streaming, the sooty smoke scouring his throat.

The tree lurched beneath them, almost throwing Rees into the foliage, and began to fall clear of its canopy of smoke. Rees scanned the sky: the falling stars wheeled by noticeably slower than before; he guessed that the tree had lost a good third of its rotation in its attempt to escape the smoke's darkness.

Pallis ran to the trunk and uncoiled a length of cable. He thrust his neck and shoulders down through the foliage and began to pay out the cable; Rees could see how he worked the cable to avoid snagging it on other trees.

At last the tree was sliding through the outer layers of the forest. Rees peered across at the trees they passed, each slowly turning and straining with dignity against its tether. Here and there he made out men and women crawling through the foliage; they waved to Pallis and called in distant voices.

As it entered the gloom of the forest, Rees sensed the tree's uncertainty. Its leaves turned this way and that as it tried to assess the irregular patterns of light playing over it. At last it came to a slow, grand decision, and its turning accelerated; with a smooth surge it rose by a few yards——and came to an abrupt halt. The cable attached to its trunk was taut now; it quivered and bowed through the air as it hauled at the tree. Rees followed the line of the cable; as he had expected its far end had reached the deck of the Raft, and two men were fixing it firmly to one of the waist-high pyramids.

He got to his knees and touched the familiar wood. Sap rushed through the shaped branch, making its surface vibrate like skin; Rees could sense

the tree’s agitation as it strove to escape this trap, and he felt an odd sympathy pull at his stomach.

Pallis made some final tests of the cable and then walked briskly around the wooden platform, checking that all the glowing bowls had been doused. At last he returned to the trunk and pulled a bundle of paperwork from a cavity in the wood. He crouched down and slipped through the foliage with a quiet rustle - and then popped his head back through. He peered around until he spotted Rees. ‘Aren’t you coming, lad? Not much point staying here, you know. This old girl won’t be going anywhere for a good few shifts. Well, come on; don’t keep Gover from his food.’

Hesitantly Rees made his way to the trunk. Pallis dropped through first. When he’d gone Gover hissed: ‘You’re a long way from home, mine rat. Just remember - nothing here is yours. Nothing.’ And the apprentice slipped into the screen of leaves.

Heart thumping, Rees followed.

Like three water drops they slid down their cable through the scented gloom of the forest.

Rees worked his way hand over hand down the thin cable. At first the going was easy, but gradually a diffuse gravity field began to tug at his feet. Pallis and Gover waited at the base of the cable, peering up at him; he swung through the last few feet, avoiding the sloping sides of the anchor cone, and landed lightly on the deck.

A man walked up bearing a battered clip pad. The man was huge, his black hair and beard barely concealing a mask of scars more livid than Pallis’s. A fine black braid was attached to the shoulder of his coverall. He scowled at Rees; the boy flinched at the power of the man’s gaze. ‘You’re welcome back, Pallis,’ the man said, his voice grim. ‘Although I can see from here you’ve brought back half your stock.’

‘Not quite, Decker,’ said Pallis coolly, handing over his paperwork. The two men moved into a huddle and went through Pallis’s lists. Gover scuffed impatiently at the deck, wiping his nose against the back of his hand.

And Rees, wide-eyed, stared.

The deck beneath his feet swept through a network of cables away into a distance he could barely comprehend. He could see buildings and people set out in great swathes of life and activity; his head seemed to spin with the

scale of it all, and he almost wished he were back in the comforting confines of the Belt.

He shook his head, trying to dispel his dizziness. He concentrated on immediate things: the easy pull of gravity, the gleaming surface beneath his feet. He tapped experimentally at the deck. It made a small ringing noise.

‘Take it easy,’ Pallis growled. The big tree-pilot had finished his business and was standing before him. ‘The plate’s only a millimetre thick, on average. Although it’s buttressed for strength.’

Rees flexed his feet and jumped a few inches into the air, feeling the pull as he settled gently back. ‘That feels like half a gee.’

Pallis nodded. ‘Closer to forty per cent. We’re in the gravity well of the Raft itself. Obviously the Nebula Core is also pulling at us - but that’s tiny; and in any event we couldn’t feel it because the Raft is in orbit around the Core.’ He tilted his face up at the flying forest. ‘Most people think the trees are there to keep the Raft from falling into the Core, you know. But their function is to stabilize the Raft - to keep it from tipping over - and to counteract the effects of winds, and to let us move the Raft when we have to . . .’ Pallis bent and peered into Rees’s face, his scars a crimson net. ‘Are you OK? You look a little dizzy.’

Rees tried to smile. ‘I’m fine. I suppose I’m just disconcerted at not being in a five-minute orbit.’

Pallis laughed. ‘Well, you’ll get used to it.’ He straightened. ‘Now then, young man, I have to decide what’s to be done with you.’

Rees felt a coldness prickle over his scalp as he began to think ahead to the moment when he would be abandoned by the tree-pilot, and scorn for himself ran through his thoughts. Had he boldly left his home only to become dependent on the kindness of a stranger? Where was his courage?

He straightened his back and concentrated on what Pallis was saying.

‘ . . . I’ll have to find an Officer,’ the pilot mused, scratching a stubbly chin. ‘Log you as a stowaway. Get you a temporary Class assignment until the next tree goes out. All that paperwork, damn it . . .

‘By the Bones, I’m too tired. And hungry, and dirty. Let’s leave it until next shift. Rees, you can stop over at my cabin until it’s sorted. You too, Gover, though the prospect is hardly enticing.’

The apprentice stared into the distance; he didn’t look around at the pilot’s words.

‘But I don’t have supplies for three growing lads like us. Or even one, come to think of it. Gover, get out to the Rim and get a couple of shifts’ worth on my number, will you? You too, Rees; why not? You’ll enjoy the sightseeing. I’ll go scrape a few layers of dust off my cabin.’

And so Rees found himself trailing the apprentice through the swarm of cables. Gover stalked ahead, not deigning to wait; in all this murky, tree-shadowed world the apprentice was Rees’s only fixed point, and so the miner made sure he didn’t lose sight of Gover’s unprepossessing back.

They came to a thoroughfare cut through the tangle of cables. It was crowded with people. Gover paused at the edge of the thoroughfare and stood in sullen silence, evidently waiting for something. Rees stood beside him and looked around. The clear, straight path was about ten yards wide: it was like looking along a tree-roofed tunnel. The path was lined with light; Rees made out globes fixed to the cables just like the globes in the depths of the star mine.

There were people everywhere, an even stream that flowed briskly in both directions along the path. Some of them stared at Rees’s dishevelled appearance, but most politely looked away. They were all clean and well-groomed - although there were hollow eyes and pale cheeks, as if some sickness were haunting the Raft. Men and women alike wore a kind of coverall of some fine, grey material; some wore gold braid on their shoulders or cuffs, often woven in elaborate designs. Rees glanced down at his own battered tunic - and with a jolt recognized it as an aged descendant of the garments of the Raft population. So miners wore Raft cast-offs?

He wondered what Sheen would say about that . . .

Two small boys were standing before him, gazing with round eyes at his dingy tunic. Rees, horribly embarrassed, hissed to Gover: ‘What are we waiting for? Can’t we move on?’

Gover swivelled his head and fixed Rees with a look of dull contempt.

Rees tried to smile at the boys. They just stared.

Now there was a soft, rushing sound from the centre of the Raft. Rees, with some relief, stepped out into the thoroughfare, and he made out the bizarre sight of a row of faces sliding towards him above the crowd. Gover stepped forward and held up a hand. Rees watched him curiously——and the rushing grew to a roar. Rees turned to see the blunt prow of a Mole bearing down on him. He stumbled back; the speeding cylinder narrowly

missed his chest. The Mole rolled to a halt a few yards from Gover and Rees. A row of simple seats had been fixed to the upper surface of the Mole; people rode in them, watching him incuriously.

Rees found his mouth opening and closing. He had expected some wonderful sights on the Raft, but - this? The little boys' mouths were round with astonishment at his antics. Gover was grinning. 'What's the matter, mine rat? Never seen a bus before?' The apprentice walked up to the Mole and, with a practised swing, stepped up into a vacant seat.

Rees shook his head and hurried after the apprentice. There was a low shelf around the base of the Mole; Rees stepped onto it and turned cautiously, lowering himself into the seat next to Gover's - and the Mole jolted into motion. Rees tumbled sideways, clinging to chair arms; he had to wriggle around until he was facing outwards, and at last found himself gliding smoothly above the heads of the throng.

The boys ran after the Mole, shouting and waving; Rees did his best to ignore them, and after a few yards they tired and gave up.

Rees stared frankly at the man next to him, a thin, middle-aged individual with a sheaf of gold braid at his cuff. The man studied him with an expression of disdain, then moved almost imperceptibly to the far side of his seat.

He turned to Gover. 'You call me a "mine rat". What exactly is a "rat"?'

Gover sneered. 'A creature of old Earth. Vermin, the lowest of the low. Have you heard of Earth? It's the place we—' he emphasized the word '—came from.'

Rees thought that over; then he studied the machine he was riding. 'What did you call this thing?'

Gover looked at him with mock pity. 'This is a bus, mine rat. Just a little something we have here in the civilized world.'

Rees studied the lines of the cylinder under its burden of furniture and passengers. It was a Mole all right; there were the scorch marks showing where - something - had been cut away. On an impulse he leaned over and thumped the surface of the 'bus' with his fist. 'Status!'

Gover studiously ignored him. Rees was aware of his thin neighbour regarding him with curious disgust—

—and then the bus reported loudly, 'Massive sensor dysfunction.'

The voice had sounded from somewhere under the thin man; he jumped and stared open-mouthed at the seat beneath him.

Gover looked at Rees with a grudging interest. ‘How did you do that?’

Rees smiled, relishing the moment. ‘Oh, it was nothing. You see, we have - ah - buses where I come from too. I’ll tell you about it some time.’

And with a delicious coolness he settled back to enjoy the ride.

The journey lasted only a few minutes. The bus paused frequently, passengers alighting and climbing aboard at each stop.

They passed abruptly out of the mass of cables and slid over a clear expanse of deck. Unimpeded Nebula light dazzled Rees. When he looked back the cables were like a wall of textured metal hundreds of feet tall, topped by discs of foliage.

The nose of the bus began to rise.

At first Rees thought it was his imagination. Then he noticed the passengers shifting in their seats; and still the tilt increased, until it seemed to Rees that he was about to slide back down a metal slope to the cables.

He shook his head tiredly. He had had enough wonders for one shift. If only Gover would give him a few hints about what was going on—

He closed his eyes. Come on, think it through, he told himself. He thought of the Raft as he had seen it from above. Had it looked bowl-shaped? No, it had been flat all the way to the Rim; he was sure of that. Then what?

Fear shot through him. Suppose the Raft was falling! Perhaps the cables on a thousand trees had snapped; perhaps the Raft was tipping over, spilling its human cargo into the pit of air—

He snorted as with a little more thought he saw it. The bus was climbing out of the Raft’s gravity well, which was deepest at the structure’s centre. If the bus’s brakes failed now it would roll back along the plane in from the Rim towards the Raft’s heart . . . just as if it were rolling downhill. In reality the Raft was, of course, a flat plate, fixed in space; but its central gravity field made it seem to tilt to anyone standing close to the Rim.

When the slope had risen to one in one the bus shuddered to a halt. A set of steps had been fixed to the deck alongside the bus’s path; they led to the very Rim. The passengers jumped down. ‘You stay there,’ Gover told Rees; and he set off after the others up the shallow stairs.

Fixed almost at the Rim was the huge, silhouetted form of what must be a supply machine. The passengers formed a small queue before it.

Rees obediently remained in his seat. He longed to examine the device at the Rim. But there would be another shift, time and fresh energy to pursue that.

It would be nice, though, to walk to the edge and peer into the depths of the Nebula . . . Perhaps he might even glimpse the Belt.

One by one the passengers returned to the bus bearing supply packets, like those which Pallis had brought to the Belt. The last passenger thumped the nose of the bus; the battered old machine lurched into motion and set off down the imaginary slope.

Pallis's cabin was a simple cube partitioned into three rooms: there was an eating area, a living room with seats and hammocks, and a cleaning area with a sink, toilet and shower head.

Pallis had changed into a long, heavy robe. The garment's breast bore a stylized representation of a tree in the green braid which Rees had come to recognize as the badge of Pallis's woodsman Class. He told Rees and Gover to clean themselves up. When it was Rees's turn he approached the gleaming spigots with some awe; he barely recognized the clean, sparkling stuff that emerged as water.

Pallis prepared a meal, a rich meat-sim broth. Rees sat cross-legged on the cabin floor and ate eagerly. Gover sat in a chair wrapped in his customary silence.

Pallis's home was free of decoration save for two items in the living area. One was a cage constructed of woven slats of wood, suspended from the ceiling; within it five or six young trees hovered and fizzed, immature branches whirling. They filled the room with motion and the scent of wood. Rees saw how the skitters, one or two adorned with bright flowers, fizzed towards the cabin lights, bumping in soft frustration against the walls of their cage. 'I let them out when they're too big,' Pallis told Rees. 'They're just - company, I suppose. You know, there are some who bind up these babies with wire to stunt their growth, distort their shapes. I can't envisage doing that. No matter how attractive the result.'

The other item of decoration was a photograph, a portrait of a woman. Such things weren't unknown in the Belt - the ancient, fading images were

handed down through families like shabby heirlooms - but this portrait was fresh and vivid. With Pallis's permission Rees picked it up—

—and with a jolt he recognized the smiling face.

He turned to Pallis. 'It's Sheen.'

Pallis shifted uncomfortably in his chair, his scars flaring red. 'I should have guessed you'd know her. We - used to be friends.'

Rees imagined the pilot and his shift supervisor together. The picture was a little incongruous - but not as immediately painful as some such couplings he had envisaged in the past. Pallis and Sheen was a concept he could live with.

He returned the photo to its frame and resumed his meal, chewing thoughtfully.

At the turn of the shift they settled for sleep.

Rees's hammock was yielding and he relaxed, feeling somehow at home. The next shift would bring more changes, surprises and confusions; but he would face that when it came. For the next few hours he was safe, cupped in the bowl of the Raft as if in the palm of a hand.

A respectful knock jolted Hollerbach out of his trance-like concentration. 'Eh? Who the hell is that?' His old eyes took a few seconds to focus - and his mind longer to clear of its whirl of food test results. He reached for his spectacles. Of course the ancient artefact didn't really fit his eyes, but the discs of glass did help a little.

A tall, scarred man loomed into semi-focus, advancing hesitantly into the office. 'It's me, Scientist. Pallis.'

'Oh, pilot. I saw your tree return, I think. Good trip?'

Pallis smiled tiredly. 'I'm afraid not, sir. The miners have had a few troubles—'

'Haven't we all?' Hollerbach grumbled. 'I just hope we don't poison the poor buggers with our food pods. Now then, Pallis, what can I do for you - oh, by the Bones, I've remembered. You've brought back that damn boy, haven't you?' He peered beyond Pallis; and there, sure enough, was the skinny, insolent figure of Gover. Hollerbach sighed. 'Well, you'd better see Grye and return to your usual duties, lad. And your studies. Maybe we'll make a Scientist of you yet, eh? Or,' he muttered as Gover departed, 'more likely I'll lob you over the Rim myself. Is that all, Pallis?'

The tree-pilot looked embarrassed; he shifted awkwardly and his scar network flared crimson. ‘Not quite, sir. Rees!’

Now another boy approached the office. This one was dark and lean and dressed in the ragged remnants of a coverall - and he stopped in surprise at the doorway, eyes fixed to the floor.

‘Come on, lad,’ Pallis said, not unkindly. ‘It’s only carpet; it doesn’t bite.’

The strange boy stepped cautiously over the carpet until he stood before Hollerbach’s desk. He raised his eyes - and again his mouth dropped with obvious shock.

‘Good God, Pallis,’ Hollerbach said, running a hand self-consciously over his bald scalp, ‘what have you brought me here? Hasn’t he ever seen a Scientist before?’

Pallis coughed; he seemed to be trying to hide a laugh. ‘I don’t think it’s that, sir. With all respect, I doubt if the lad’s ever seen anyone so old.’

Hollerbach opened his mouth - then closed it again. He inspected the boy more carefully, noting the heavy muscles, the scarred hands and arms. ‘Where are you from, lad?’

He spoke up clearly. ‘The Belt.’

‘He’s a stowaway,’ Pallis said apologetically. ‘He travelled back with me and—’

‘And he’s got to be shipped straight home.’ Hollerbach sat back and folded his skinny arms. ‘I’m sorry, Pallis; we’re overpopulated as it is.’

‘I know that, sir, and I’m having the forms processed right now. As soon as a tree is loaded he could be gone.’

‘Then why bring him here?’

‘Because . . .’ Pallis hesitated. ‘Hollerbach, he’s a bright lad,’ he finished in a rush. ‘He can - he gets status reports from the buses—’

Hollerbach shrugged. ‘So do a good handful of smart kids every shift.’ He shook his head, amused. ‘Good grief, Pallis, you don’t change, do you? Do you remember how, as a kid, you’d bring me broken skitters? And I’d have to fix up little paper splints for the things. A damn lot of good it did them, of course, but it made you feel better.’

Pallis’s scars darkened furiously; he avoided Rees’s curious gaze.

‘And now you bring home this bright young stowaway and - what? - expect me to take him on as my chief apprentice?’

Pallis shrugged. ‘I thought, maybe just until the tree was ready . . .’

‘You thought wrong. I’m a busy man, tree-pilot.’

Pallis turned to the boy. ‘Tell him why you’re here. Tell him what you told me, on the tree.’

Rees was staring at Hollerbach. ‘I left the Belt to find out why the Nebula is dying,’ he said simply.

The Scientist sat forward, intrigued despite himself. ‘Oh, yes? We know why it’s dying. Hydrogen depletion. That’s obvious. What we don’t know is what to do about it.’

Rees studied him, apparently thinking it over. Then he asked: ‘What’s hydrogen?’

Hollerbach drummed his long fingers on the desk top, on the point of ordering Pallis out of the room . . . But Rees was waiting for an answer, a look of bright inquiry in his eyes.

‘Hmm. That would take more than a sentence to explain, lad.’ Another drum of the fingers. ‘Well, maybe it wouldn’t do any harm - and it might be amusing—’

‘Sir?’ Pallis asked.

‘Are you any good with a broom, lad? The Bones know we could do with someone to back up that useless article Gover. Yes, why not? Pallis, take him to Grye. Get him a few chores to do; and tell Grye from me to start him on a bit of basic education. He may as well be useful while he’s eating our damn food. Just until the tree flies, mind.’

‘Hollerbach, thanks—’

‘Oh, get out, Pallis. You’ve won your battle. Now let me get on with my work. And in future keep your damn lame skitters to yourself!’

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4

A handbell shaken somewhere told him that the shift was over. Rees peeled off his protective gloves and with an expert eye surveyed the lab; after his efforts its floor and walls now gleamed in the light of the globes fixed to the ceiling.

He walked slowly out of the lab. The light from the star above made his exposed skin tingle, and he rested for a few seconds, drinking in gulps of antiseptic-free air. His back and thighs ached and the skin of his upper arms itched in a dozen places: trophies of splashes of powerful cleaning agents.

The few dozen shifts before the next tree departure seemed to be flying past. He drank in the exotic sights and scents of the Raft, anticipating a return to a lifetime in a lonely cabin in the Belt; he would pore over these memories as Pallis must treasure his photograph of Sheen.

But what he'd been shown and taught had been precious little, he admitted to himself - despite Hollerbach's vague promises. The Scientists were an unprepossessing collection - mostly middle-aged, overweight and irritable. Brandishing the bits of braid that denoted their rank they moved about their strange tasks and ignored him. Grye, the assistant who'd been assigned the task of educating him, had done little more than provide Rees with a child's picture book to help him read, together with a pile of quite incomprehensible lab reports.

Although he'd certainly learned enough about cleaning, he reflected ruefully.

But occasionally, just occasionally, his skitter-like imagination would be snagged by something. Like that series of bottles, set out like bar stock in one of the labs, filled with tree sap in various stages of hardening—

'You! What's your name? Oh, damn it, you, boy! Yes, you!'

Rees turned to see a pile of dusty volumes staggering towards him. 'You, the lad from the mine. Come and give me a hand with this stuff . . .' Over the volumes appeared a round face topped by a bald scalp, and Rees recognized Cipse, the Chief Navigator. Forgetting his aches he hurried towards the puffing Cipse and, with some delicacy, took the top half of the pile.

Cipse panted with relief. 'Took your time, didn't you?'

'I'm sorry . . .'

‘Well, come on, come on; if we don’t get these printouts to the Bridge sharpish those buggers in my team will have cleared off to the bars again, you mark my words, and that’ll be another shift lost.’ Rees hesitated, and after a few paces Cipse turned. ‘By the Bones, lad, are you deaf as well as stupid?’

Rees felt his mouth working. ‘I . . . you want me to bring this stuff to the Bridge?’

‘No, of course not,’ Cipse said heavily. ‘I want you to run to the Rim and dump it over the side, what else . . .? Oh, for the love of - come on, come on!’

And he set off once more.

Rees stood there for a full half-minute.

The Bridge . . . !

Then he ran after Cipse towards the heart of the Raft.

The city on the Raft had a simple structure. Seen from above - without its covering deck of trees - it would have appeared as a series of concentric circles.

The outermost circle, closest to the Rim, was fairly empty, studded by the imposing bulks of supply machines. Within that was a band of storage and industrial units, a noisy, smoky place. Next came residential areas, clusters of small cabins of wood and metal. Rees had come to understand that the lower-placed citizens occupied the cabins closest to the industrial region. Within the housing area was a small region containing various specialist buildings: a training unit, a crude hospital - and the labs of the Scientist class where Rees was living and working. Finally, the innermost disc of the Raft - into which Rees had not previously been allowed - was the preserve of the Officers.

And at the centre, at the hub of the Raft itself, was embedded the gleaming cylinder which Rees had spotted on his first arrival here.

The Bridge . . . And now, perhaps, he might be allowed to enter it.

The Officers’ cabins were larger and better finished than those of the ordinary crew; Rees stared with some awe at the carved door frames and curtained windows. Here there were no running children, no perspiring workers; Cipse slowed his bustle to a more stately walk, nodding to the gold-braided men and women they encountered.

Pain lanced through Rees's foot as he stubbed his toe on a raised deck plate. His load of books tumbled to the surface, yellowed pages opening tiredly to reveal tables of numbers; each page was stamped with the mysterious letters 'IBM'.

'Oh, by the Bones, you useless mine rat!' Cipse raged. Two young Officer cadets walked by; the braid in their new caps glittered in the starlight and they pointed at Rees, laughing quietly.

'I'm sorry,' Rees said, face burning. How had he tripped? The deck was a flat mosaic of welded iron plates . . . or was it? He stared down. The plates here were curved and studded with rivets, and their sheen was silvery, a contrast to the rusty tinge of the iron sheets further out. On one plate, a few feet away, was a blocky, rectangular design; it was tantalizingly incomplete, as if huge letters had once been painted on a curving wall, and the surface cut up and reassembled.

Cipse muttered, 'Come on, come on . . .'

Rees picked up the books and hurried after Cipse. 'Scientist,' he said nervously, 'why is the deck here so different?'

Cipse gave him a glance of exasperation. 'Because, lad, the innermost part of the Raft is the oldest. The areas further out were added later, constructed of sheets of star metal; this part was built of hull sections. All right?'

'Hull? The hull of what?'

But Cipse, bustling along, would not reply.

Rees's imagination whirled like a young tree. Hull plates! He imagined the hull of a Mole; if that were cut up and reassembled then that, too, would be an uneven thing of broken curves.

But the shell of a Mole would be much too small to provide all this area. He imagined a huge Mole, its mighty walls curving far above his head . . .

But that wouldn't be a Mole. A Ship, then? Were the children's tales of the Ship and its Crew true after all?

He felt frustration well up inside him; it was almost like the ache he sometimes felt to reach out to Sheen's cool flesh . . . If only someone would tell him what was going on!

At last they passed through the innermost rank of dwellings and came to the Bridge. Rees found his pace slowing despite his will; he felt his heart pump within his chest.

The Bridge was beautiful. It appeared as a half-cylinder twice his height and perhaps a hundred paces long; it lay on its side, embedded neatly in the deck. Rees remembered flying under the Raft and seeing the other half of the cylinder hanging beneath the plates like some vast insect. The pile of books still in his arms, he stepped closer to the curving wall. The surface was of a matt, silvery metal that softened the harsh starlight to a pink-gold glow. An arched door frame had been cut into the wall; its lines were the finest, cleanest work Rees had ever seen. The plates of the disassembled hull lapped around the cylinder, and Rees saw how neatly they had been cut and joined to the wall.

He tried to imagine the men who had done this wonderful work. He had a vague picture of godlike creatures disassembling another, huge, cylinder with glowing blades . . . And later generations had added their crude accretions around the gleaming heart of the Raft, their grace and power dwindling as thousands of shifts wore away.

‘. . . I said now, mine rat!’ The Navigator’s face was pink with fury; Rees shook himself out of his daydream and hurried to join Cipse at the doorway.

Another Scientist emerged from the shining interior of the Bridge; he took Rees’s load. Cipse gave Rees one last glance. ‘Now get back to your work, and be thankful if I don’t tell Hollerbach to feed you to the reprocessing plants—’ Muttering, the Navigator turned and disappeared into the interior of the Bridge.

Reluctant to leave this magical area Rees reached out and stroked the silver wall with his fingertips - and pulled his hand back, startled; the surface was warm, almost like skin, and impossibly smooth. He pushed his hand flat against the wall and let his palm slide over the surface. It was utterly frictionless, as if slick with some oily fluid—

‘What’s this? A mine rat nibbling at our Bridge?’

He turned with a start. The two young Officers he had noticed earlier stood before him, hands on hips; they grinned easily. ‘Well, boy?’ the taller of them said. ‘Do you have any business here?’

‘No, I—’

‘Because if not, I suggest you clear off back to the Belt where the other rats hide out. Or perhaps we should help you on your way, eh, Jorge?’

‘Doav, why not?’

Rees studied the relaxed, handsome young men. Their words were scarcely harsher than Cipse's had been . . . but the youth of these cadets, the way they aped their elders so unthinkingly, made their contempt almost impossible to stomach, and Rees felt a warm anger well up inside him.

But he couldn't afford to make enemies.

Deliberately he turned his face away from the cadets and made to step past them . . . But the taller cadet, Doav, was in his way. 'Well, rat?' He extended one finger and poked at Rees's shoulder—

—and, almost against his will, Rees grabbed the finger in one fist; with an easy turn of his wrist he bent the cadet's hand back on itself. The young man's elbow was forced forward to save the finger from snapping, and his knees bent into a half-kneel before Rees. Pain showed in a sheen of sweat on his brow, but he clenched his teeth, refusing to cry out.

Jorge's smile faded; his hands hung at his sides, uncertain.

'My name is Rees,' the miner said slowly. 'Remember that.'

He released the finger. Doav slumped to his knees, nursing his hand; he glared up. 'I'll remember you, Rees; have no fear,' he hissed.

Already regretting his outburst Rees turned his back and walked away. The cadets didn't follow.

Slowly Rees dusted his way around Hollerbach's office. Of all the areas to which his chores brought him access, this room was the most intriguing. He ran a fingertip along a row of books; their pages were black with age and the gilt on their spines had all but worn away. He traced letters one by one: E . . . n . . . c . . . y . . . c . . . Who, or what, was an 'Encyclopaedia'? He daydreamed briefly about picking up a volume, letting it fall open . . .

Again that almost sexual hunger for knowledge swept through him.

Now his eye was caught by a machine, a thing of jewelled cogs and gears about the size of his cupped hands. At its centre was set a bright silver sphere; nine painted orbs were suspended on wires around the sphere. It was beautiful, but what the hell was it?

He glanced about. The office was empty. He couldn't resist it.

He picked up the device, relishing the feel of the machined metal base —

'Don't drop it, will you?'

He started. The intricate device juggled through the air, painfully slowly; he grabbed it and returned it to its shelf.

He turned. Silhouetted in the doorway was Jaen, her broad, freckled face creased into a grin. After a few seconds he smiled back. ‘Thanks a lot,’ he said.

The apprentice walked towards him. ‘You should be glad it’s only me. Anybody else and you’d be off the Raft by now.’

He shrugged, watching her approach with mild pleasure. Jaen was the senior apprentice of Cipse, the Chief Navigator; only a few hundred shifts older than Rees, she was one of the few inhabitants of the labs to show him anything other than contempt. She even seemed to forget he was a mine rat, sometimes . . . Jaen was a broad, stocky girl; her gait was confident but ungainly. Uncomfortably Rees found himself comparing her with Sheen. He was growing fond of Jaen; he believed she could become a good friend.

But her body didn’t pull at his with the intensity of the mine girl’s.

Jaen stood beside him and ran a casual fingertip over the little device. ‘Poor old Rees,’ she mocked. ‘I bet you don’t even know what this is, do you?’

He shrugged. ‘You know I don’t.’

‘It’s called an orrery.’ She spelt the word for him. ‘It’s a model of the Solar System.

‘The what?’

Jaen sighed, then she pointed at the silver orb at the heart of the orrery. ‘That’s a star. And these things are balls of - iron, I suppose, orbiting around it. They’re called planets. Mankind - the folk on the Raft, at least - originally came from one of these planets. The fourth, I think. Or maybe the third.’

Rees scratched his chin. ‘Really? There can’t have been too many of them.’

‘Why not?’

‘No room. If the planet was any size the gees would be too high. The star kernel back home is only fifty yards wide - and it’s mostly air - and it has a surface gravity of five gee.’

‘Yeah? Well, this planet was a lot bigger. It was—’ She extended her hands. ‘Miles wide. And the gravity wasn’t crushing. Things were different.’

‘How?’

‘ . . . I’m not sure. But the surface gravity was probably only, I don’t know, three or four gee.’

He thought that over. ‘In that case, what’s a gee? I mean, why is a gee the size it is - no larger and no smaller?’

Jaen had been about to say something else; now she frowned in exasperation. ‘Rees, I haven’t the faintest idea. By the Bones, you ask stupid questions. I’m almost tempted not to tell you the most interesting thing about the orrery.’

‘What?’

‘That the System was huge. The orbit of the planet took about a thousand shifts . . . and the star at the centre was a million miles wide!’

He thought that over. ‘Garbage,’ he said.

She laughed. ‘What do you know?’

‘A star like that is impossible. It would just implode.’

‘You know it all.’ She grinned at him. ‘I just hope you’re as clever at lugging supplies in from the Rim. Come on; Grye has given us a list of stuff to collect.’

‘OK.’

Carrying his cleaning equipment he followed her broad back from Hollerbach’s office. He glanced back once at the orrery, sitting gleaming in the shadows of its shelf.

A million miles? Ridiculous, of course.

But what if . . .?

They sat side by side on the bus; the machine’s huge tyres made the journey soothingly smooth.

Rees surveyed the mottled plates of the Raft, the people hurrying by on tasks and errands of whose nature even now he was uncertain. His fellow passengers sat patiently through the journey, some of them reading. Rees found these casual displays of literacy somehow startling.

He found himself sighing.

‘What’s the matter with you?’

He grinned ruefully at Jaen. ‘Sorry. It’s just . . . I’ve been here such a short time, and I seem to have learned so little.’

She frowned. ‘I thought you were getting some kind of crammer classes from Cipse and Grye.’

‘Not really,’ he admitted. ‘I guess I can see their point of view. I wouldn’t want to waste time on a stowaway who is liable to be dumped back home within a few shifts.’

She scratched her nose. ‘That might be the reason. But the two of them have never been shy of parading their knowledge in front of me. Rees, you ask damn hard questions. I suspect they’re a little afraid of you.’

‘That’s crazy—’

‘Let’s face it, most of those old buggers don’t know all that much. Hollerbach does, I think; and one or two others. But the rest just follow the ancient printouts and hope for the best. Look at the way they patch up the ancient instruments with wood and bits of string . . . They’d be lost if anything really unexpected happened - or if anyone asked them a question from a strange angle.’

Rees thought that over and reflected how far his view of the Scientists had shifted since his arrival here. Now he saw that they were frail humans like himself, struggling to do their best in a world growing shabbier. ‘Anyway,’ he said, ‘it doesn’t make a lot of difference. Every time I open my eyes I see questions that don’t get answered. For instance, on every page of Cipse’s numbers books is written “IBM”. What does that mean?’

She laughed. ‘You’ve got me there. Maybe it’s something to do with the way those books were produced. They come from the Ship, you know.’

His interest quickened. ‘The Ship? You know, I’ve heard so many stories about that I’ve no idea what’s true.’

‘My understanding is that there really was a Ship. It was broken up to form the basis of the Raft itself.’

He pondered that. ‘And the original Crew printed those books?’

She hesitated, obviously near the limits of her knowledge. ‘They were produced a few generations later. The first Crew had kept their understanding in some kind of machine.’

‘What machine?’

‘. . . I don’t know. Maybe a talking machine, like the buses. The thing was more than a recording device, though. It could do calculations and computations.’

‘How?’

‘Rees,’ she said heavily, ‘if I knew that I’d build one. OK? Anyway, with the passing of time the machine began to fail, and the crew were afraid

they wouldn’t be able to continue their computations. So, before it expired, the machine printed out everything it knew. And that includes an ancient type of table called “logarithms” to help us do calculations. That’s what Cipse was lugging in to the Bridge. Maybe you’ll learn how to use logarithms, some day.’

‘Yeah. Maybe.’

The bus rolled out of the thicket of cables; Rees found himself squinting in the harsh light of the star poised above the Raft.

Jaen was saying, ‘You understand Cipse’s job, do you?’

‘I think so, he said slowly. ‘Cipse is a Navigator. His job is to work out where the Raft should move to.’

Jaen nodded. ‘And the reason we have to do that is to get out of the path of the stars falling in from the rim of the Nebula.’ She jerked a thumb at the glowing sphere above. ‘Like that one. In the Bridge they keep records of approaching stars, so they can move the Raft in plenty of time. I reckon we’ll be shifting soon . . . That’s a sight to see, Rees; I hope you don’t miss it. All the trees tilting in unison, the rush of wind across the deck - and if I get through my appraisal I’ll be working on the moving team.’

‘Good for you,’ he said sourly.

With a sudden seriousness she patted his arm. ‘Don’t give up hope, miner. You’re not off the Raft yet.’

He smiled at her, and they spent the rest of the journey in silence.

The bus reached the edge of the Raft’s gravity well. The Rim approached like a knife edge against the sky, and the bus strained to a halt beside a broad stairway. Rees and Jaen joined a queue of passengers before a supply dispenser. An attendant sat sullenly beside the machine, silhouetted against the sky; Rees, staring absently, found him vaguely familiar.

The supply machine was an irregular block as tall as two men. Outlets pierced its broad face, surrounding a simple control panel reminiscent to Rees of the Mole’s. On the far side a nozzle like a huge mouth strained outwards at the atmosphere of the Nebula; Rees had learned that the machine’s raw material was drawn in by that nozzle from the life-rich air, and it wasn’t hard to imagine the machine taking huge breaths through those metal lips.

Jaen murmured in his ear: ‘Powered by a mini black hole, you know.’

He jumped. ‘A what?’

She grinned. ‘You don’t know? I’ll tell you later.’

‘You enjoy this, don’t you?’ he hissed.

Away from the shelter of the flying forest the starlight from above was intense. Rees found sweat droplets trickling into his eyes; he blinked, and found himself staring at the broad neck of the man in front of him. The flesh was studded with coarse black hair and was glistening damp near the collar. The man raised a wide, pug face to the star. ‘Damn heat,’ he grunted. ‘Don’t know why we’re still sitting underneath the bloody thing. Mith ought to get off his fat arse and do something about it. Eh?’ He glared inquisitively at Rees.

Rees smiled back uncertainly. The man gave him a strange look, then turned away.

After uncomfortable minutes the queue cleared, passengers squeezing past them down the stairs with their packets of food, water and other materials. Watched by the sullen attendant, Rees and Jaen stepped up to the machine; Jaen began to tap into the control panel one of the Scientists’ registration numbers, and then a complex sequence detailing their requirements. Rees marvelled at the way her fingers flew over the keyboard - yet another skill he might never get the chance to learn . . .

And he became aware that the attendant was grinning at him. The man sat on a tall wooden stool, arms folded; black stripes were stitched into his shabby coverall. ‘Well, well,’ he said slowly. ‘It’s the mine rat.’

‘Hello, Gover,’ Rees said stiffly.

‘Still skivvying for those old farts in Science, eh? I’d have thought they’d chuck you into the nozzles by now. All you mine rats are good for . . .’

Rees found his fists clenching; his biceps bunched almost painfully.

‘So you’re still the same nasty piece of work, eh, Gover?’ Jaen snapped. ‘Getting thrown out of Science hasn’t helped your character development, then.’

Gover bared yellow teeth. ‘I chose to leave. I’m not spending my life with those useless old space-wasters. At least with Infrastructure I’m doing real work. Learning real skills.’

Jaen lodged her fists on her hips. ‘Gover, if it wasn’t for the Scientists the Raft would have been destroyed generations ago.’

He sniffed, looking bored. ‘Sure. You keep believing it.’

‘It’s the truth.’

‘Maybe once. But what about now? Why haven’t they moved us out from under that thing in the sky, then?’

Jaen took an angry breath . . . then hesitated, having no easy answer.

Gover didn’t seem interested in his small victory. ‘It doesn’t matter. Think what you want. The people who really keep this Raft flying - Infrastructure, the woodsmen, the carpenters and metal-workers - we are going to be heard before long. And that will be the start of the long drop for all the parasites.’

Jaen frowned. ‘What’s that supposed to mean?’

But Gover had turned away, smiling cynically; and a man behind them growled, ‘Come on; move it, you two.’

They returned to the bus clutching pallets of supplies. Rees said, ‘What if he’s right, Jaen? What if the Scientists, the Officers are - not allowed to work any more?’

She shivered. ‘Then it’s the end of the Raft. But I know Gover; he’s just puffing up his own importance, to make us think he’s happy with his move to Infrastructure. He’s always been the same.’

Rees frowned. Maybe, he thought.

But Gover had sounded very sure.

A few shifts later Hollerbach asked to see Rees.

Rees paused outside the Chief Scientist’s office, drawing deep breaths. He felt as if he were poised on the Rim of the Raft; the next few moments might shape the rest of his life.

Pushing his shoulders back he entered the office.

Hollerbach was bent over paperwork by the light of a globe over his desk. He scowled up at Rees’s approach. ‘Eh? Who’s that? Oh, yes; the miner lad. Come in, come in.’ He waved Rees to a chair before the desk; then he rested back in his armchair, bony arms folded behind his head. The light above the desk made the hollows around his eyes seem enormously deep.

‘You asked to see me,’ Rees said.

‘I did, didn’t I?’ Hollerbach stared frankly at Rees. ‘Now then; I hear you’ve been making yourself useful around the place. You’re a hard worker, and that’s something all too rare . . . So thank you for what you’ve done. But,’ he went on gently, ‘a supply tree has been loaded and is ready to fly to

the Belt. Next shift. What I have to decide is whether you're to be on it or not.'

A thrill coursed through Rees; perhaps he still had a chance to earn a place here. Anticipating some kind of test, he hastily reviewed the fragments of knowledge he had acquired.

Hollerbach got out of his chair and began to walk around the office. 'You know we're overpopulated here,' he said. 'And we have . . . problems with the supply dispensers, so that's not going to get any easier. On the other hand, now that I've shed that useless article Gover I have a vacancy in the labs. But unless it's really justified I can't make a case for keeping you.'

Rees waited.

Hollerbach frowned. 'You keep your own counsel, don't you, lad? Very well . . . If you were going to ask me one question, now, before you're shipped out of here - and I guaranteed to answer it as fully as I could - what would it be?'

Rees felt his heart pound. Here was the test, the moment of Rim balancing - but it had come in such an unexpected form. One question! What was the one key that might unlock the secrets against which his mind battered like a skitter against a globe lamp?

The seconds ticked away; Hollerbach regarded him steadily, thin hands steepled before his face.

At last, almost on impulse, Rees asked: 'What's a gee?'

Hollerbach frowned. 'Explain.'

Rees bunched his fists. 'We live in a universe filled with strong, shifting gravity fields. But we have a standard unit of gravitational acceleration . . . a gee. Why should this be so? And why should it have the particular value it does?'

Hollerbach nodded. 'And what answer would you anticipate?'

'That the gee relates to the place man came from. It must have had a large area over which gravity was stable, with a value of what we call a gee. So that became the standard. There's nowhere in the universe with such a region - not even the Raft. So maybe some huge Raft in the past, that's now broken up—'

Hollerbach smiled, the skin stretching over his bony jaw. 'That's not bad thinking . . . Suppose I told you that there has never been anywhere in this universe with such a region?'

Rees thought that over. ‘Then I’d suggest that men came here from somewhere else.’

‘Are you sure about that?’

‘Of course not,’ Rees said defensively. ‘I’d have to check it out . . . find more evidence.’

The old Scientist shook his head. ‘Boy, I suspect there’s more scientific method in your untrained head than in whole cadres of my so-called assistants.’

‘But what’s the answer?’

Hollerbach laughed. ‘You are a rare creature, aren’t you? More interested in understanding than in your own fate . . .

‘Well, I’ll tell you. Your guess was quite right. Men don’t belong in this universe. We came here in a Ship. We passed through something called Bolder’s Ring, which was a kind of gateway. Somewhere in the cosmos on the other side of the Ring is the world we came from. It’s a planet, incidentally; a sphere, not a Raft, about eight thousand miles wide. And its surface has a gravity of exactly one gee.’

Rees frowned. ‘Then it must be made of some gas.’

Hollerbach took the orrery from the shelf and studied the tiny planets. ‘It’s a ball of iron, actually. It couldn’t exist . . . here.

‘Gravity is the key to the absurd place we’re stranded in, you see; gravity here is a billion times as strong as in the universe we came from. Here our home planet would have a surface gravity of a billion gees - if it didn’t implode in an instant. And celestial mechanics are a joke. The home world takes more than a thousand shifts to orbit around its star. Here it would take just seventeen minutes!

‘Rees, we don’t believe the Crew intended to bring the Ship here. It was probably an accident. As soon as the increased gravity hit, large parts of the Ship collapsed. Including whatever they used to propel it through the air. They must have fallen into the Nebula, barely understanding what was happening, frantically seeking a way to stay out of the Core . . .’

Rees thought of the foundry implosion and his imagination began to construct a scene . . .

. . . Crew members hurried through the corridors of their falling Ship; smoke filled the passageways as lurid flames singed the air. The hull was breached; the raw air of the Nebula scoured through the cabins, and

through rents in the silver walls the Crew saw flying trees and huge, cloudy whales, all utterly unlike anything in their experience . . .

‘The Bones alone know how they survived those first few shifts. But survive they did; they harnessed trees and stayed out of the clutches of the Core; and gradually men spread through the Nebula, to the Belt worlds and beyond—’

‘What?’ Rees’s focus snapped back to the present. ‘But I thought you were describing how the Raft folk got here . . . I assumed that Belt folk and the others—’

‘Came from somewhere else?’ Hollerbach smiled, looking tired. ‘It’s rather convenient for us, in comparative comfort here on the Raft, to believe so; but the fact is that all the humans in the Nebula originated on the Ship. Yes, even the Boneys. And in fact this myth of disparate origins is probably damaging the species. We need to cross-breed, to expand the size of our gene pool . . .’

Rees thought that over. In retrospect there were so many obvious points of similarity between life here and in the Belt. But the thought of the obvious differences, of the relentless harshness of Belt life, began to fill him with a cold anger.

Why, for instance, shouldn’t the Belt have its own supply machine? If they had a shared origin surely the miners were as entitled as the Raft dwellers . . .

There would be time to think on this later. He tried to concentrate on what Hollerbach was saying. ‘. . . So I’ll be frank with you, young man. We know the Nebula is almost spent. And unless we do something about it we’ll be spent too.’

‘What will happen? Will the air turn unbreathable?’

Hollerbach replaced the orrery tenderly. ‘Probably. But long before that the stars will go out. It will get cold and dark . . . and the trees will start to fail.

‘We’ll have nothing to hold us steady any more. We’ll fall into the Core, and that will be that. It should be quite a ride . . .

‘If we’re not to take that death ride, Rees, we need Scientists. Young ones; inquiring ones who might think up a way out of the trap the Nebula is becoming. Rees, the secret of a Scientist is not what he knows. It’s what he asks. I think you’ve got that trick. Maybe, anyway . . .’

A flush warmed Rees's cheeks. 'You're saying I can stay?'

Hollerbach sniffed. 'It's still probationary, mind; for as long as I think it needs to be. And we'll have to fix up some real education for you. Chase Grye a bit harder, will you?' The old Scientist shuffled back to his desk and lowered himself into his seat. He took his spectacles from a pocket of his robe, perched them on his nose, and bent once more over his papers. He glanced up at Rees. 'Anything else?'

Rees found himself grinning. 'Can I ask one more question?'

Hollerbach frowned in irritation. 'Well, if you must—'

'Tell me about the stars. On the other side of Bolder's Ring. Are they really a million miles across?'

Hollerbach tried to maintain his mask of irritation; but it dissolved into a half-smile. 'Yes. And some much bigger! They're far apart, studded around an almost empty sky. And they last, not a thousand shifts like the wretched specimens here, but thousands of billions of shifts!'

Rees tried to imagine such glory. 'But . . . how?'

Hollerbach began to tell him.

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5

After Rees's interview with Hollerbach, Grye took him to a dormitory building. There was room for about fifty people in the long, flat building, and Rees, overwhelmed by self-consciousness, trailed the fussy Scientist down an aisle between two rows of simple pallets. Beside each pallet was a small cupboard and a rack on which clothes could be hung; Rees found himself staring curiously at the few personal possessions scattered on the floor and cupboard tops - combs and razors, small mirrors, simple sewing kits, here and there photographs of families or young women. One young man - another Science apprentice, judging by the crimson strands woven into his coveralls - lounged on a pallet. He raised narrow eyebrows at Rees's unkempt appearance, but he nodded, friendly enough. Rees nodded back, his cheeks burning, and hurried after Grye.

He wondered what this place was. Pallis's cabin - where he had lodged since his arrival - had seemed unimaginably luxurious to his Belt-developed tastes, and this was hardly so grand, but surely still the dwelling of some exalted class. Perhaps Rees was to clean it out; maybe he would be given somewhere to sleep nearby—

They reached a pallet free of sheets or blankets; the cupboard beside it swung open, empty. Grye waved his hand dismissively. 'Here will do, I think.' And he turned to walk back down the dormitory.

Rees, confused, followed him

Grye turned on him. 'By all the bloody Bones, what's the matter with you, boy? Don't you understand simple speech?'

'I'm sorry—'

'Here.' Grye pointed once more at the pallet and spoke slowly and excessively clearly, as if to a simple child. 'You will sleep here from now on. Do I need to write it down?'

'No—'

'Put your personal possessions in the cupboard.'

'I don't have any—'

'Get yourself blankets from the stores,' Grye said. 'The others will show you where.' And, oblivious of Rees's lost stare at his back, Grye scurried from the building and on to his next chore.

Rees sat on the pallet - it was soft and clean - and ran a finger over the well-worked lines of the little cupboard. His cupboard.

His breath gathered in him and he felt a deep warmth spread through his face. Yes, it was his cupboard, his pallet - this was his place on the Raft.

He really had made it.

He sat on the pallet for some hours, oblivious of the amused stares of the dormitory's other occupants. Just to be still, safe, to be able to anticipate classes tomorrow; that was enough for now.

'I heard how you fooled old Hollerbach.'

The words floated through Rees's numbness; looking up, he found himself staring into the fine, cruel face of the Officer cadet he had bested outside the Bridge - he fumbled for the name - Doav? 'As if having to live in these shacks wasn't bad enough. Now we have to share them with the likes of this rat—'

Rees looked within himself and found only calm and acceptance. This wasn't a time for fighting. Deliberately he looked into Doav's eyes, grinned slowly, and winked.

Doav snorted and turned away. With much noise and banging of cupboards he collected his belongings from a pallet a few places from Rees's and moved them to the far end of the hut.

Later, the friendly lad who had acknowledged Rees earlier strolled past his pallet. 'Don't worry about Doav. We're not all as bad.'

Rees thanked him, appreciating the gesture. But he noticed that the boy did not move his place any nearer to Rees's, and as the shift end neared and more apprentices gathered for sleep it soon became apparent that Rees's pallet was an island surrounded by a little moat of empty places.

He lay down on his unmade bed, tucked his legs, and smiled, not worried one bit.

In theory, Rees learned, the Raft was a classless society. The ranks of Scientists, Officers and the rest were open to anyone regardless of the circumstances of their birth, depending only on merit and opportunity. The 'Classes' of the Raft were based on roles of the Crew of the semi-legendary Ship; they denoted function and utility, so he was told, and not power or position. So the Officers were not a ruling class; they were servants of the rest, bearing a heavy responsibility for the day-to-day maintenance of the

Raft's social order and infrastructure. In this analysis the Captain was the least of all, weighed down by the heaviest burden.

So he was told.

At first Rees, his experience of human society limited to the harsh environment of the Belt, was prepared to believe what he was taught so solemnly, and he dismissed the snobbish cruelty of Doav and the rest as expressions of immaturity. But as his circle of acquaintances widened, and as his understanding - formally and informally acquired - grew, he formed a rather different picture.

It was certainly possible for a young person from a non-Officer Class to become an Officer. But, oddly enough, it never happened. The other Classes, excluded from power by the hereditary rule of the Officers, reacted by building what power bases they could. So the Infrastructure personnel had turned the Raft's engineering details into an arcane mystery known only to initiates; and without appeasement of their key figures - men like Pallis's acquaintance, Decker - they would exert their power to cut water or food supplies, dam up the sewers built into the deck, or bring the Raft to a halt in any of a hundred ways.

Even the Scientists, whose very reason for being was the pursuit of understanding, were not immune from this rivalry for power.

The Scientists were crucial to the Raft's survival. In such matters as the moving of the Raft, the control of epidemics, the redesign of sections of the Raft itself, their knowledge and structured way of thinking was essential. And without the tradition the Scientists maintained - which explained how the universe worked, how humans could survive in it - the fragile social and engineering web which comprised the Raft would surely disintegrate within a few thousand shifts. It wasn't its orbit around the Core which kept the Raft aloft, Rees told himself; it was the continuance of human understanding.

So the Scientists had a vital, almost sacred responsibility. But, Rees reflected, it didn't stop them using their precious knowledge for advantage every bit as unscrupulously as any of Decker's workmen blocking up a sewer. The Scientists had a statutory obligation to educate every apprentice of supervisory status regardless of Class, and they did so - to a nominal extent. But only Science apprentices, like Rees, were allowed past the bare facts and actually to see the ancient books and instruments . . .

Knowledge was hoarded. And so only those close to the Scientists had any real understanding of humanity's origins, even of the nature of the Raft, the Nebula. Listening to chatter in refectories and food machine queues Rees came to understand that most people were more concerned about this shift's ration size, or the outcome of spurious sporting contests, than the larger issues of racial survival. It was as if the Nebula was eternal, as if the Raft itself was fixed atop a pillar of steel, securely and for all time!

The mass of people was ignorant, driven by fashions, fads and the tongues of orators . . . even on the Raft. As for the human colonies away from the Raft - the Belt mine and (perhaps) the legendary, lost Boney worlds - there, Rees knew from his own experience, understanding of the human past and the structure of the universe had been reduced to little more than fanciful tales.

Fortunately for the Scientists, most of the other Classes' apprentices were quite happy with this state of affairs. The Officer cadets in particular sat through their lectures with every expression of disdain, clearly eager to abandon this dry stuff for the quick of life, the exercise of power.

So the Scientists went unchallenged, but Rees wasn't sure about the wisdom of their policy. The Raft itself, while still comfortable and well-supplied compared to the Belt, was now riven by shortages. Discontent was widespread, and - since the people did not have the knowledge to understand the (more or less) genuine contribution to their welfare made by the more privileged Classes - those Classes were more often than not the target of unfocused resentment.

It was an unstable mixture.

And the enslaving of knowledge had another adverse effect, Rees realized. Turning facts into precious things made them seem sacred, immutable; and so he saw Scientists scrutinise old printouts and intone litanies of wisdom brought here by the Ship and its Crew, unwilling - or unable - to entertain the idea that there might be facts beyond the ageing pages, even - breathe it quietly - inaccuracies and mistakes!

Despite all his doubts and questions, Rees found the shifts following his acceptance the happiest of his life. As a fully fledged apprentice he was entitled to more than Grye's grudging picture-book sessions; now he sat in classes with the other apprentices and learned in a structured and consistent way. For hours outside his class time he would study his books and

photographs - and he would never forget an ancient picture buried in one battered folder, a photograph of the blue rim of the Nebula.

Blue!

The magical colour filled his eyes, every bit as clear and cool as he had always imagined.

At first, Rees sat, awkwardly, with apprentices some thousands of shifts younger than himself; but his understanding progressed rapidly, to the grudging admiration of his tutors, and before long he had caught up and was allowed to join the classes of Hollerbach himself.

Hollerbach's style as a teacher was as vivid and captivating as the man himself. Abandoning yellowing texts and ancient photographs, the old Scientist would challenge his charges to think for themselves, adorning the concepts he described with words and gestures.

One shift he had each member of the class build a simple pendulum - a dense metal bob attached to a length of string - and time its oscillation against the burning of a candle. Rees set up his pendulum, limiting the oscillations to a few degrees as Hollerbach instructed, and counted the swings carefully. A few benches along he was vaguely aware of Doav languidly going through the motions of the experiment; whenever Hollerbach's fierce eye was averted Doav would poke at the swinging bob before him, elaborately bored.

It didn't take long for the students to establish that the period of the pendulum's swing depended only on the length of the string - and was independent of the mass of the bob.

This simple fact seemed wonderful to Rees (and that he had found it out for himself made it still more so); he stayed in the little student lab for many hours after the end of the class extending the experiment, probing different mass ranges and larger amplitudes of swing.

The next class was a surprise. Hollerbach entered grandly and eyed the students, bade them pick up the retort stands to which their pendulums were still fixed, and beckoned. Then he turned and marched from the lab.

The students nervously followed, clutching their retorts; Doav rolled his eyes at the tedium of it all.

Hollerbach led them on a respectable hike, out along an avenue beneath the canopy of turning trees. The sky was clear of cloud today and starlight dappled the plates of the deck. Despite his age Hollerbach kept up a good

pace, and by the time he paused, under open sky a few yards beyond the edge of the flying forest, Rees suspected that his weren't the only young legs that ached a little. He looked around curiously, blinking in the direct starlight; since beginning classes he had scarcely had a chance to come out this way, and the apparent tilt of the riveted deck under his feet felt strange.

Solemnly Hollerbach lowered himself to the deck plates and sat cross-legged, then bade his students do the same. He fixed a series of candles to the plates. 'Now, ladies and gentlemen,' he boomed, 'I would like you to repeat your experiments of our last class. Set up your pendulum.'

There were stifled groans around the class, presumably inaudible to Hollerbach. The students began work, and Hollerbach, restless, got up and paced among them. 'You are Scientists, remember,' he told them. 'You are here to observe, not judge; you are here to measure and understand . . .'

Rees's results were . . . odd. As Hollerbach's supply of candles burned through he went over his results carefully, repeating and testing.

At last Hollerbach called them to order. 'Conclusions, please? Doav?'

Rees heard the cadet's breathy groan. 'No difference,' he said languidly. 'Same result curve as last time.'

Rees frowned. That was wrong; the periods he had measured had been greater than yesterday's - by a small amount, granted, but greater consistently.

The silence gathered. Doav shifted uneasily.

Then Hollerbach let him have it. Rees tried not to grin as the old Scientist tore into the cadet's sloppy methods, his closed mind, his laziness, his lack of fitness to wear the golden braids. By the end of it Doav's cheeks burned crimson.

'Let's have the truth,' Hollerbach muttered, breathing hard. 'Baert . . .?'

The next apprentice supplied an answer consistent with Rees's. Hollerbach said, 'Then what has happened? How have the conditions of this experiment changed?'

The students speculated, listing the effect of the starlight on the pendulum bobs, the greater inaccuracy of the timing method - Hollerbach's candles flickered far more out here than in the lab - and many other ideas. Hollerbach listened gravely, occasionally nodding.

None of it convinced Rees. He stared at the simple device, willing it to offer up its secrets.

At last Baert said hesitantly, ‘What about gravity?’

Hollerbach raised his eyebrows. ‘What about it?’

Baert was a slender, tall boy; now he rubbed his thin nose uncertainly. ‘We’re a little further from the Raft’s centre of gravity here, aren’t we? So the pull of gravity on the pendulum bob will be a bit less . . .’

Hollerbach eyed him fiercely, saying nothing. Baert flushed and went on, ‘It’s gravity that makes the bob swing, by pulling at it. So if gravity’s less, the period will be longer . . . Does that make sense?’

Hollerbach rocked his head from side to side. ‘At least that’s a little less dubious than some of the other proposals I’ve heard. But if so, what precisely is the relationship between the strength of gravity and the period?’

‘We can’t say,’ Rees blurted. ‘Not without more data.’

‘Now that,’ Hollerbach said, ‘is the first intelligent thing any of you have said this shift. Well, ladies and gentlemen, I suggest you proceed to gather your facts. Let me know what you find out.’ He stood, stiffly, and walked away.

The students dispersed to their task with varying degrees of enthusiasm. Rees went at it with a will, and for the next few shifts scoured the deck, armed with his pendulum, notepad and supply of candles. He recorded the period of the pendulum, made careful notes and drew logarithmic scale graphs - and more; carefully he observed how the plane of the pendulum’s swing formed various angles with the surface, showing how the local vertical was changing as he moved across the face of the Raft. And he watched the slow, uncertain oscillations of the pendulum at the Rim itself.

At last he took his findings to Hollerbach. ‘I think I have it,’ he said hesitantly. ‘The period of the pendulum is proportional to the square root of its length . . . and also inversely proportional to the square root of the acceleration due to gravity.’

Hollerbach said nothing; he steepled liver-spotted fingers before his face and regarded Rees gravely.

At length Rees blurted, ‘Am I correct?’

Hollerbach looked disappointed. ‘You must learn, boy, that in this business there are no right answers. There are only good guesses. You have made an empirical prediction; well, fine. Now you must check it against the body of theory you have learned.’

Inwardly Rees groaned. But he went away and did so.

Later he showed his findings on the strength and direction of the Raft's gravitational field to Hollerbach. 'The way the field varies is quite complex,' he said. 'At first I thought it might fall off as the inverse square of the distance from the centre of the Raft; but you can see that's not true . . .'

'The inverse square law holds only for point masses, or for perfectly spherical objects. Not for something shaped like a dinner plate, like the Raft.'

'Then what is . . .?'

Hollerbach merely eyed him.

'I know,' Rees sighed. 'I should go and work it out. Right?'

It took him longer than the pendulum problem. He had to learn to integrate in three dimensions . . . and how to use vector forces and equipotential surfaces . . . and how to make sensible approximating assumptions.

But he did it. And when he'd done that, there was another problem. And another, and still another . . .

It wasn't all work.

One shift Baert, with whom Rees struck up a diffident friendship, offered Rees a spare ticket to something called the Theatre of Light. 'I won't pretend you're my first choice companion,' Baert grinned. 'She was a bit better looking than you . . . But I don't want to miss the show, or waste a ticket.'

Rees thanked him, turning the strip of cardboard over in his hands. 'The Theatre of Light? What is it? What goes on there?'

'There aren't too many theatres in the Belt, eh? Well, if you haven't heard, wait and see . . .'

The Theatre was situated beyond the tethered forest, about three-quarters of the way to the Rim. There was a bus service from the Raft's central regions but Baert and Rees chose to walk. By the time they had reached the head-high fence which surrounded the Theatre the deck appeared to be sloping quite steeply, and the walk had become a respectable climb. Out here on the exposed deck, far from the cover of the forest canopy, the heat of the star above the Raft was a tangible thing, and both of them arrived with faces slick with sweat.

Baert turned awkwardly, slippered feet gripping at the riveted slope, and grinned down at Rees. ‘Kind of a hike,’ he said. ‘But it’ll be worth it. Do you have your ticket?’

Rees fumbled in his pockets until he found the precious piece of cardboard. Bemused, he watched as Baert presented the tickets to a doorkeeper and then followed Baert through a narrow gate.

The Theatre of Light was an oval some fifty yards along its long axis, which ran down the apparent slope of the deck. Benches were fixed across the upper part of the Theatre. Rees and Baert took their places and Rees found himself looking down at a small stage which was fixed on stilts so that it rested at the local horizontal - so at an angle to the ‘tilted’ deck - and beyond the stage, serving as a mighty backdrop to the show, he could see the centre of the Raft tip away, a vast metal slope of boxy buildings and whirling, rustling trees.

The Theatre filled up rapidly. Rees estimated there was room for about a hundred people here, and he shivered a little, uncomfortable at the thought of so many people in one place.

‘Drinks?’

He turned with a start. A girl, luminously pretty, stood beside his seat with a tray of glasses. He tried to smile back and form an answer, but there was something odd about the way she was standing . . .

Without effort or discomfort she was standing perpendicularly to the deck; she ignored the apparent tilt of the deck and stood as naturally as if it were level. Rees felt his jaw drop, and all his carefully constructed reasoning about the illusory tilt of the deck evaporated. For if she was vertical then he was sitting at an angle with nothing at his back—

With a stifled yell he tumbled backwards.

Baert, laughing, helped him up, and the girl, with an apologetic smile, presented him with a tumbler of some clear, sweet beverage. Rees could feel his cheeks burn like stars. ‘What was all that about?’

Baert suppressed his laughter. ‘I’m sorry. It gets them every time. I should have warned you, really . . .’

‘But how does she walk like that?’

Baert’s thin shoulders moved in a shrug. ‘If I knew it would spoil the fun. Magnetic soles on her shoes? The funny thing is, it’s not the girl that

knocks you over . . . It’s the collapse of your own perceptions, the failure of your sense of balance.’

‘Yeah, hilarious.’ Rees sucked sourly at his drink and watched the girl move through the crowd. Her footsteps seemed easy and natural, and try as he might he failed to see how she kept her balance. Soon, though, there were more spectacular acts to watch. Jugglers, for instance, with clubs that swooped and soared in arcs at quite impossible angles, returning infallibly to their owners’ hands.

During applause Rees said to Baert, ‘It’s like magic.’

‘Not magic,’ the other said. ‘Simple physics; that’s all there is to it. I guess this is making your miner’s eyes pop out, eh?’

Rees frowned. On the Belt there wasn’t a lot of time for juggling . . . and no doubt the labour of the miners was going to pay for all this, in some indirect fashion. Discreetly he glanced around at the rest of the audience. Plenty of gold and crimson braid, not a lot of black or the other colours. Upper Classes only? He suppressed a stab of resentment and returned his attention to the show.

Soon it was time for the main feature. A trampoline was set up to cover the stage and the crowd grew hushed. Some wind instrument evoked a plaintive melody and a man and a woman dressed in simple leotards took the stage. They bowed once to the audience, climbed onto the trampoline, and together began to soar high into the starlit air. At first they performed simple manoeuvres - slow, graceful somersaults and twists - pleasing to the eye, but hardly spectacular.

Then the couple hit the trampoline together, jumped high, met at the top of their arcs - and, without touching, they twisted around each other, so that each was thrown wide.

Baert gasped. ‘Now, how did they do that?’

‘Gravity,’ Rees whispered. ‘Just for a second they orbited around each other’s centre of mass.’

The dance went on. The partners twisted around each other, throwing their lithe bodies into elaborate parabolae, and Rees watched through half-closed eyes, entranced. The physicist in him analysed the dancers’ elaborate movements. Their centres of mass, located somewhere around their waists, traced out hyperbolic orbits in the varying gravity fields of the Raft, the stage and the dancers themselves, so that each time the dancers launched

themselves from their trampoline the paths of their centres were more or less determined . . . But the dancers adorned the paths with movements of their slim bodies so deceptively that it seemed that the two of them were flying through the air at will, independent of gravity. How paradoxical, Rees thought, that the billion-gee environment of this universe should afford humans such freedom.

Now the dancers launched into a final, elaborate arc, their bodies orbiting, their faces locked together like facing planets. Then it was over; the dancers stood hand-in-hand atop their trampoline, and Rees cheered and stamped with the rest. So there was more to do with billion-strength gravity than measure it and fight it—

A flash, a muffled rush of air, a sudden blossom of smoke. The trampoline, blasted from below, turned briefly into a fluttering, birdlike creature, a dancer itself; the dancers, screaming, were hurled into the air. Then the trampoline collapsed into the splintered ruins of the stage, the dancers falling after it.

The audience, stunned, fell silent. The only sound was a low, broken crying from the wreckage of the stage, and Rees watched, unbelieving, as a red-brown stain spread over the remains of the trampoline.

A burly man bearing orange braids hurried from the wings and stood commandingly before the audience. ‘Sit down,’ he ordered. ‘No one should try to leave.’ And he stood there as the audience quietly obeyed. Rees, looking around, saw more orange braids at the exits from the Theatre, still more working their way into the ruins of the stage.

Baert’s face was pale. ‘Security,’ he whispered. ‘Report directly to the Captain. You don’t see them around too often, but they’re always there . . . undercover as often as not.’ He sat back and folded his arms. ‘What a mess. They’ll interrogate us all before they let us out of here; it will take hours—’

‘Baert, I don’t understand any of this. What happened?’

Baert shrugged. ‘What do you think? A bomb, of course.’

Rees felt an echo of the disorientation he had suffered when the drinks girl had walked by. ‘Someone did this deliberately?’

Baert looked at him sourly and did not reply.

‘Why?’

‘I don’t know. I don’t speak for those people.’ Baert rubbed the side of his nose. ‘But there’s been a few of these attacks, directed against Officers,

mostly, or places they're likely to be. Like this.

'Not everyone's happy here, you see, my friend,' he went on. 'A lot of people think the Officers get more than their share.'

'So they're turning to actions like this?' Rees turned away. The red-stained trampoline was being wrapped around the limp bodies of the gravity dancers. He remembered his own flash of resentment at Baert, not more than an hour before this disaster. Perhaps he could sympathize with the motives of the people behind this act - why should one group enjoy at leisure the fruits of another's labour? - but to kill for such a reason?

The orange-braided security men began to organize strip searches of the crowd. Resigned, not speaking, Rees and Baert sat back to wait their turn.

Despite isolated incidents like the Theatre attack Rees found his new life fascinating and rewarding, and the shifts wore away unbelievably quickly. All too soon, it seemed, he had finished his Thousand Shifts, the first stage of his graduation process, and it was time for his achievement to be honoured.

And so he found himself sitting on a decorated bus and studying the crimson braids of a Scientist (Third Class), freshly stitched to the shoulder of his coverall, and shivering with a sense of unreality. The bus worked its way through the suburbs of the Raft. Its dozen young occupants, Rees's fellow graduate-apprentices, spun out a cloud of laughter and talk.

Jaen was studying him with humorous concern, a slight crease over her broad nose; her hands rested in the lap of her dress uniform. 'Something on your mind?'

He shrugged. 'I'm fine. You know me. I'm the serious type.'

'Damn right. Here.' Jaen reached to the boy sitting on the far side from Rees and took a narrow-necked bottle. 'Drink. You're graduating. This is your Thousandth Shift and you're entitled to enjoy it.'

'Well, it isn't precisely. I was a slow starter, remember. For me it's more like a thousand and a quarter—'

'Oh, you boring bugger, drink some of this stuff before I kick you off the bus.'

Rees, laughing, gave in and took a deep draught from the bottle.

He had sampled some tough liquors in the Quartermaster's bar, and plenty of them had been stronger than this fizzing wine-sim; but none of them had quite the same effect. Soon the globe lights lining the avenue of

cables seemed to emit a more friendly light; Jaen's gravity pull mingling with his was a source of warmth and stillness; and the brittle conversation of his companions seemed to grow vivid and amusing.

His mood persisted as they emerged from beneath the canopy of flying trees and reached the shadow of the Platform. The great lip of metal jutted inwards from the Rim, forming a black rectangle cut out of the crimson of the sky, its supporting braces like gaunt limbs. The bus wheezed to a halt alongside a set of wide stairs. Rees, Jaen and the rest tumbled from the bus and clambered up the stairs to the Platform.

The Thousandth Shift party was already in full swing, bustling with perhaps a hundred graduates of the various Classes of the Raft. A bar set up on trestle tables was doing healthy business, and a discordant set of musicians was thumping out a rhythmic sound - there were even a few couples tentatively dancing, near the band's low stage. Rees, with Jaen in tolerant tow, set off on a tour of the walls of the Platform.

The Platform was an elegant idea: to fix a hundred-yard-square plate to the Rim at such an angle that it matched the local horizontal, surround it by a wall of glass, and so reveal a universe of spectacular views. At the inward edge was the Raft itself, tilted like some huge toy for Rees's inspection. As at the Theatre the sensation of being on a safe, flat surface gave the proximity of the vast slope a vertiginous thrill.

The space-facing edge of the Platform was suspended over the Rim of the Raft, and a section of the floor was inset with sheets of glass. Rees stood over the depths of the Nebula; it felt as if he were floating in the air. He could see hundreds of stars scattered in a vast three-dimensional array, illuminating the air like mile-wide globe lamps; and at the centre of the view, towards the hidden Core of the Nebula, the stars were crowded together, so that it was as if he were staring into a vast, star-walled shaft.

'Rees. I congratulate you.' Rees turned. Hollerbach, gaunt, unsmiling and utterly out of place in all this gaiety, stood beside him.

'Thank you, sir.'

The old Scientist leaned towards him conspiratorially. 'Of course, I didn't doubt you'd do well from the first.'

Rees laughed. 'I can tell you I doubted it sometimes.'

'A Thousand Shifts, eh?' Hollerbach scratched his cheek. 'Well, I've no doubt you'll go much further . . . And in the meantime here's something for

you to think about, boy. The ancients, the first Crew, didn't measure time exclusively in shifts. We know this from their records. They used shifts, yes, but they had other units: a "day", which was about three shifts, and a "year", which was about a thousand shifts. How old are you now?'

'About seventeen thousand, I believe, sir.'

'So you'd be about seventeen "years" old, eh? Now then - what do you suppose these units, a "day" and a "year", referred to?' But before Rees could answer Hollerbach raised his hand and walked off. 'Baert! So they've let you get this far despite my efforts to the contrary—'

Bowls of sweetmeats had been set out around the walls. Jaen nibbled on some fluffy substance and tugged absently at his hand. 'Come on. Isn't that enough sightseeing and science?'

Rees looked at her, the combination of wine-sim and stars leaving him quite dazed. 'Hm? You know, Jaen, the stories of our home universe notwithstanding, sometimes this seems a very beautiful place.' He grinned. 'And you don't look too bad yourself.'

She punched him in the solar plexus. 'And nor do you. Now let's have a dance.'

'What?' His euphoria evaporated. He looked past her shoulder at the whirl of dancing couples. 'Look, Jaen, I've never danced in my life.'

She clicked her tongue. 'Don't be such a coward, you mine rat. Those people are just ex-apprentices like you and me, and I can tell you one thing for sure: they won't be watching you.'

'Well . . .' he began, but it was too late; with a determined grip on his forearm she led him to the centre of the Platform.

His head filled with memories of the unfortunate gravity dancers at the Theatre of Light and their swooping, spectacular ballet. If he lived for fifty thousand shifts he would never be able to match such grace.

Luckily this dance was nothing like that.

Young men eyed girls across a few yards of floor. Those who were dancing were enthusiastic but hardly expert; Rees watched for a few seconds, then began to imitate their rhythmic swaying.

Jaen pulled a face at him. 'That's bloody awful. But who cares?'

In the low-gee conditions - gravity here was about half its value near the Labs - the dance had a dreamy slowness. After a while Rees began to relax; and, eventually, he realized he was enjoying himself—

—until his legs whisked out from under him; he clattered to the Platform with a slow bump. Jaen covered her face with one hand, suppressing giggles; a circle of laughter clustered briefly around him. He got to his feet. ‘I’m sorry—’

There was a tap on his shoulder. ‘So you should be.’

He turned; there, with a broad, glinting grin, stood a tall young man with the braids of a Junior Officer. ‘Doav,’ Rees said slowly. ‘Did you trip me?’

Doav barked laughter.

Rees felt his forearm muscles bunch. ‘Doav, you’ve been an irritation to me for the last year . . .’

Doav looked baffled.

‘ . . . I mean, the last thousand shifts.’ And it was true; Rees could bear the constant sniping, cracks and cruelties of Doav and his like throughout his working day . . . but he would much prefer not to have to. And, since the incident at the Theatre, he had come to see how attitudes like Doav’s were the cause of a great deal of pain and suffering on the Raft; and, perhaps, of much more to come.

The wine-sim was like blood now, pounding in his head. ‘Cadet, if we’ve something to settle—’

Doav fixed him with a look of contempt. ‘Not here. But soon. Oh, yes; soon.’ And he turned his back and walked off through the throng.

Jaen thumped Rees’s arm hard enough to make him flinch. ‘Do you have to turn every incident into an exhibition? Come on; let’s get a drink.’ She stamped her way towards the bar.

‘Hello, Rees.’

Rees paused, allowing Jaen to slip ahead into the crush around the bar. A thin young man stood before him, hair plastered across his scalp. He wore the black braids of Infrastructure and he regarded Rees with cool appraisal.

Rees groaned. ‘Gover. I guess this isn’t to be the best shift I’ve ever had.’

‘What?’

‘Never mind. I haven’t seen you since not long after my arrival.

‘Yeah, but that’s not hard to understand.’ Gover flicked delicately at Rees’s braid. ‘We move in different circles, don’t we?’

Rees, already on edge after the incident with Doav, studied Gover as coolly as he could. There were still the same sharp features, the look of petulant anger - but Gover looked more substantial, more sure of himself.

‘So you’re still skivvying for those old farts in the Labs, eh?’

‘I’m not going to respond to that, Gover.’

‘You’re not?’ Gover rubbed at his nostrils with the palm of his hand. ‘Seeing you in this toy uniform made me wonder how you see yourself now. I bet you haven’t done a shift’s work - real work - since you landed here. I wonder what your fellow rats would think of you now. Eh?’

Rees felt blood surge once more to his cheeks; the wine-sim seemed to be turning sour. There was a seed of confusion inside him. Was his anger at Gover just a way of shielding himself from the truth, that he had betrayed his origins . . .?

‘What do you want, Gover?’

Gover took a step closer to Rees. His stale breath cut through the wine fumes in Rees’s nostrils. ‘Listen, mine rat, believe it or not I want to do you a favour.’

‘What kind of favour?’

‘Things are changing here,’ Gover said slyly. ‘Do you understand what I’m saying? Things won’t always be as they are now.’ He eyed Rees, evidently unwilling to go further.

Rees frowned. ‘What are you talking about? The discontents?’

‘That’s what some call them. Seekers of justice, others say.’

The noise of the revellers seemed to recede from Rees; it was as if Gover and he shared their own Raft somewhere in the air. ‘Gover, I was in the Theatre of Light, that shift. Was that justice?’

Gover’s eyes narrowed. ‘Rees, you’ve seen how the elite on this Raft keep the rest of us down - and how their obscene economic system degrades the rest of the Nebula’s human population. The time is near when they will have to atone.’

Rees stared at him. ‘You’re one of them, aren’t you?’

Gover bit his lip. ‘Maybe. Look, Rees, I’m taking a chance talking to you like this. And if you betray me I’ll deny we ever had this conversation.’

‘What do you want of me?’

‘There are good men in the cause. Men like Decker, Pallis—’

Rees guffawed. Decker - the huge Infrastructure worker he had encountered on his first arrival here - he could believe. But Pallis? ‘Come on, Gover.’

Gover was unruffled. ‘Damn it, Rees, you know what I think of you. You’re a mine rat. You don’t belong here, among decent people. But where you come from makes you one of us. All I’m asking is that you come along and listen to what they have to say. With your access to the Science buildings you could be . . . useful.’

Rees tried to clear his thinking. Gover was a vicious, bitter young man, and his arguments - the contradictory mixture of contempt and appeal to fellow-feeling he directed at Rees, for example - were simple-minded and muddled. But what gave Gover’s words force was their terrible truth. Part of Rees was appalled that such as Gover could so quickly disorient him - but inside him a core of anger flared up in response.

But if some revolution were to occur - if the Labs were smashed, the Officers imprisoned - what then?

‘Gover, look up.’

Gover raised his face.

‘See that star up there? If we don’t move the Raft the star will graze us. And then we’ll fry. And even if we were to survive that - look further out.’ He swept an arm around the red-stained sky. ‘The Nebula’s dying and we’ll die with it. Gover, only the Scientists, backed by the organization of the Raft, can save us from such dangers.’

Gover scowled and spat at the deck. ‘You seriously believe that? Come on, Rees. I’ll tell you something. The Nebula could support us all for a long time yet - if its resources were shared equally. And that’s all we want.’ He paused.

‘Well?’

Rees closed his eyes. Would sky wolves discuss Gover’s case as they descended on the wreck of the Raft and picked clean the bones of his children? ‘Get lost, Gover,’ he said tiredly.

Gover sneered. ‘If that’s what you want. I can’t say I’m sorry . . .’ He grinned at Rees with something approaching pure contempt. Then he slid away through the crowd.

The noise seemed to swirl around Rees, not touching him. He pushed his way through the crush to the bar and ordered straight liquor, and

downed the hot liquid in one throw.

Jaen joined him and grabbed his arm. ‘I’ve been looking for you. Where . . .?’ Then she felt the bunched muscles under Rees’s jacket; and when he turned to face her, she shrank back from his anger.

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6

The Scientist Second Class stood in the doorway of the Bridge. He watched the new Third Class approach and tried to hide a smile. The young man's uniform was so obviously new, he stared with such awe at the Bridge's silver hull, and his pallor was undisputable evidence of his Thousandth Shift celebration, which had finished probably mere hours earlier . . . The Second Class felt quite old as he remembered his own Thousandth Shift, his own arrival at the Bridge, a good three thousand shifts ago.

At least this boy had a look of inquiry about him. So many of the apprentices the Second had to deal with were sullen and resentful at best, downright contemptuous at worst; and the rates of absenteeism and dismissal were worsening. He reached out a hand as the young man approached.

'Welcome to the Bridge,' said Scientist Second Class Rees.

The boy - blond, with a premature streak of grey - was called Nead. He smiled uncertainly.

A bulky, grim-faced security guard stood just inside the door. He fixed Nead with a threatening stare; Rees saw how the boy quailed. Rees sighed. 'It's all right, lad; this is just old Forv; it's his job to remember your face, that's all.' It was only recently, Rees realized a little wistfully, that such heavy-handed security measures had come to seem necessary; with the continuing decline in food supplies, the mood on the Raft had worsened, and the severity and frequency of the attacks of the 'discontents' were increasing. Sometimes Rees wondered if—

He shook his head to dismiss such thoughts; he had a job to do. He walked the wide-eyed boy slowly through the Bridge's gleaming corridors. 'It's enough for now if you get an idea of the layout of the place,' he said. 'The Bridge is a cylinder a hundred yards long. This corridor runs around its midriff. The interior is divided into three rooms - a large middle chamber and two smaller chambers towards the ends. We think that the latter were once control rooms, perhaps equipment lockers; you see, the Bridge seems to have been a part of the original Ship . . .'

They had reached one of the smaller chambers; it was stacked with books, piles of paper and devices of all shapes and sizes. Two Scientists,

bent in concentration, sat cocooned in dust. Nead turned flat, brown eyes on Rees. ‘What’s this room used for now?’

‘This is the Library,’ Rees said quietly. ‘The Bridge is the most secure place we have, the best protected from weather, accident - so we keep our records here. As much as we can: one copy of everything vital, and some of the stranger artefacts that have come down to us from the past . . .’

They walked on, following the corridor to a shallow staircase set into the floor. They began to descend towards a door set in the inner wall, which led to the Bridge’s central chamber. Rees thought of warning the boy to watch his step - then decided against it, a slightly malicious humour sparkling within him.

Nead took three or four steps down - then, arms flailing, he tipped face-forward. He didn’t fall; instead he bobbed in the stairwell, turning a slow somersault. It was as if he had fallen into some invisible fluid.

Rees grinned broadly.

Nead, panting, reached for the wall. His palms flat against the metal he steadied himself and scrambled back up the steps. ‘By the Bones,’ he swore, ‘what’s down there?’

‘Don’t worry, it’s harmless,’ Rees said. ‘It caught me the first time too. Nead, you’re a Scientist now. Think about it. What happened when you went down those steps?’

The boy looked blank.

Rees sighed. ‘You passed through the plane of the Raft’s deck, didn’t you? It’s the metal of the deck that provides the Raft’s gravity pull. So here - at the centre of the Raft, and actually in its plane - there is no pull. You see? You walked into a weightless zone.’

Nead opened his mouth - then closed it again, looking puzzled.

‘You’ll get used to it,’ Rees snapped. ‘And maybe, with time, you’ll even understand it. Come on.’

He led the way through the doorway to the central chamber, and was gratified to hear Nead gasp.

They had entered an airy room some fifty yards long. Most of its floor area was transparent, a single vast window which afforded a vertiginous view of the depths of the Nebula. Gaunt machines taller than men were fixed around the window. To Nead’s untutored eye, Rees reflected, the machines must look like huge, unlikely insects, studded with lenses and

antennae and peering into some deep pool of air. The room was filled with a clean smell of ozone and lubricating oil; servomotors hummed softly.

There were perhaps a dozen Scientists working this shift; they moved about the machines making adjustments and jotting copious notes. And because the plane of the Raft passed over the window-floor at about waist height, the Scientists bobbed in the air like boats in an invisible pond, their centres of gravity oscillating above and below the equilibrium line with periods of two or three seconds. Rees, looking at the scene as if through new eyes, found himself hiding another grin. One small, round man had even, quite unselfconsciously, turned upside down to bring his eyes closer to a sensor panel. His trousers rode continually towards the equilibrium plane, so that his short legs protruded, bare.

They stood on a low ledge; Rees took a step down and was soon floating in the air, his feet a few inches from the window-floor. Nead lingered nervously. ‘Come on, it’s easy,’ Rees said. ‘Just swim in the air, or bounce up and down until your feet hit the deck.’

Nead stepped off the ledge and tumbled forward, slowly bobbing upright. He reminded Rees of a child entering a pool for the first time. After a few seconds a slow smile spread across the young man’s face; and soon he was skimming about the room, his feet brushing at the window below.

Rees took him on a tour around the machines.

Nead shook his head. ‘This is amazing.’

Rees smiled. ‘This equipment is among the best preserved of the Ship’s materiel. It’s as if it were unloaded only last shift . . . We call this place the Observatory. All the heavy-duty sensors are mounted here, and this is where - as a member of my Nebular physics team - you’ll be spending most of your time.’ They stopped beside a tube ten feet long and encrusted with lenses. Rees ran a palm along the instrument’s jewelled flank. ‘This baby’s my favourite,’ he said. ‘Beautiful, isn’t she? It’s a Telescope which will work at all wavelengths - including the visual. Using this we can see right down into the heart of the Nebula.’

Nead thought that over, then glanced at the ceiling. ‘Don’t we ever need to look outwards?’

Rees nodded approvingly. Good question. ‘Yes, we do. There are ways of making the roof transparent - in fact, we can opaque the floor, if we want to.’ He glanced at the instrument’s fist-sized status panel. ‘We’re in luck;

there are no observations currently running. I'll give you a quick guided tour of the Nebula. You should know most of what I'll tell you from your studies so far, and don't worry about the details for now . . .' Slowly he punched a sequence of commands into the keypad mounted below the sensor. He became aware that the lad was watching him curiously. Maybe he's never seen anyone with such rusty keyboard skills, Rees reflected, here on this Raft of a hundred supply machines—

The stab of old resentment shocked him. Never mind . . .

A disc of ceiling faded to transparency, revealing a red sky. Rees indicated a monitor plate mounted on a slim post close to the Telescope. The plate abruptly filled with darkness punctuated by fuzzy lens shapes; the lenses were all colours, from red through yellow to the purest blue. Once more Nead gasped.

'Let's review a few facts,' Rees began. 'You know we live in a Nebula, which is an ellipse-shaped cloud of gas about five thousand miles across. Every particle of the Nebula is orbiting the Core. The Raft is in orbit too, embedded in the Nebula like a fly on a spinning plate; we circle the Core every twelve shifts or so. The Belt mine is further in and only takes about nine shifts to complete its orbit. When the pilots fly between mine and Raft their trees are actually changing orbits . . . ! Fortunately the gradients in orbital speeds are so shallow out here that the velocities the trees can reach are enough for them easily to fly from one orbit to another. Of course the pilots must plan their courses carefully, to make sure the Belt mine isn't on the other side of the Core when they arrive at the right orbit . . .

'Here we're looking through the Observatory roof and out of the Nebula. Normally the atmosphere shields this view from us, but the Telescope can unscramble the atmospheric scattering and show us what we'd see if the air were stripped away.'

Nead peered closer at the picture. 'What are those blobs? Are they stars?'

Rees shook his head. 'They're other nebulae: some larger than ours, some smaller, some younger - the blue ones - and some older. As far as we can see with this Telescope - and that's hundreds of millions of miles - space is filled with them.

'All right; let's move inwards.' With a single keystroke the picture changed to reveal a blue-purple sky; stars glittered, white as diamonds.

‘That’s beautiful,’ Nead breathed. ‘But it can’t be in our Nebula—’

‘But it is.’ Rees smiled sadly. ‘You’re looking at the topmost layer, where the lightest gases - hydrogen and helium - separate out. That is where stars form. Turbulence causes clumps of higher density; the clumps implode and new stars burst to life.’ The stars, balls of fusion fire, formed dense bow waves in the thin atmosphere as they began their long, slow fall into the Nebula. Rees went on,

‘The stars shine for about a thousand shifts before burning out and dropping, as a cool ball of iron, into the Core . . . Most of them anyway; one or two of the kernels end up in stable orbits around the Core. That’s where the star mines come from.’

Nead frowned. ‘And if the path of a falling star intersects the orbit of the Raft—’

‘Then we’re in trouble, and we must use the trees to change the Raft’s orbit. Fortunately, star and Raft converge slowly enough for us to track the star on its way towards us . . .’

‘If new stars are being formed, why do people say the Nebula is dying?’

‘Because there are far fewer than before. When the Nebula was formed it was almost pure hydrogen. The stars have turned a lot of the hydrogen into helium, carbon and other heavy elements. That’s how the complex substances which support life here were formed.

‘Or rather, it’s life for us. But it’s a slow, choking death for the Nebula. From its point of view oxygen, carbon and the rest are waste products. Heavier than hydrogen, they settle slowly around the Core; the residual hydrogen gets less and less until - as today - it’s reduced to a thin crust around the Nebula.’

Nead stared at the sparse young stars. ‘What will happen in the end?’

Rees shrugged. ‘Well, we’ve observed other nebulae. The last stars will fail and die. Deprived of energy the airborne life of the Nebula - the whales, the sky wolves, the trees, and the lesser creatures they feed on - will cease to exist.’

‘Are there truly such things as whales? I thought they were just stories —’

Rees shrugged. ‘We never see them out here, but we have plenty of evidence from travellers who’ve entered the depths of the Nebula.’

‘What, as far as the Belt mine, you mean?’

Rees suppressed a smile. ‘No, even further than that. The Nebula is a big place, lad; there is room to hide a lot of mystery. Perhaps there are even lost human colonies; perhaps the Boneys really exist, and all those legends are true . . . of the subhuman whale-singers lost in the sky.’

The boy shuddered.

‘Of course,’ Rees mused, ‘there are puzzles about the native life of the Nebula. For example, how can it exist at all? Our records show that life in the home universe took thousands of billions of shifts to evolve. The Nebula isn’t anything like that old - and will be far younger when it dies. So how did life arise?’

‘You were telling me what will happen after the stars go out . . .’

‘Yes. The atmosphere, darkened, will steadily lose heat, and - less able to resist the gravity of the Core - will collapse. Finally the Nebula will be reduced to a layer a few inches thick around the Core, slowly falling inwards . . .’

The young man, his face pale, nodded slowly.

‘All right,’ Rees said briskly. ‘Let’s look inwards now - past the Raft’s level, which is a thousand miles from the edge of the Nebula - and in to the centre.’

Now the monitor filled up with a familiar ruddy sky. Stars were scattered sparsely through the air. Rees punched a key—

- and stars exploded out of the picture. The focus plummeted into the Nebula and it was as if they were falling.

Finally, the star cloud began to thin and a darker knot of matter emerged at its centre.

‘What you’re seeing here is a layer of detritus in close orbit around the Core,’ Rees said quietly. ‘At the heart of this Nebula is a black hole. If you’re not sure what that is right now, don’t worry . . . The black hole is about a millionth of an inch wide; the large object we call the Core is a dense mass of material surrounding the hole. We can’t see through this cloud of rubble to the Core itself, but we believe it’s an ellipsoid about fifty miles across. And somewhere inside the Core will be the black hole itself and an accretion disc around it, a region perhaps a hundred feet wide in which matter is crushed out of existence as it is dragged into the hole . . .

‘At the surface of the Core the hole’s gravity is down to a mere two or three gee. At the outer edge of the Nebula - where we are - it’s down to

about one thousandth of a gee; but even though it's so small here the hole's gravity is what binds this Nebula together.

'And if we could travel into the Core itself we would find gravity climbing to thousands, millions of gee. Hollerbach has some theories about what happens near and within the Core, a realm of what he calls "gravitic chemistry".'

Nead frowned. 'I don't understand.'

'I bet you don't.' Rees laughed. 'But I'll tell you anyway, so you'll know the questions to ask . . .

'You see, in the day-to-day turmoil of things we - even we Scientists - tend to forget the central, astonishing fact of this cosmos - that the gravitational constant is a billion times larger than in the universe from which man arose. Oh, we see the macroscopic effects - for instance, a human body exerts a respectable gravitational field! - but what about the small, the subtle, the microscopic effects?'

In man's original universe, Rees went on, gravity was the only significant force over the interstellar scale. But over short ranges - on the scale of an individual atom - gravity was so tiny as to be negligible. 'It is utterly dominated by even the electromagnetic force,' Rees said. 'And that is why our bodies are shambling cages of electromagnetism; and attractive electrical forces between molecules drive the chemistry that sustains our being.

'But here . . .' He rubbed his nose thoughtfully. 'Here, things are different. Here, in certain circumstances, gravity can be as significant on the atomic scale as other forces - even dominant.

'Hollerbach talks of a new kind of "atom". Its fundamental particles would be massive - perhaps they would be tiny black holes - and the atom would be bonded by gravity in novel, complex structures. A new type of chemistry - a gravitic chemistry - would be possible; a new realm of nature about whose form even Hollerbach can scarcely begin to speculate.'

Nead frowned. 'But why haven't we observed this "gravitic chemistry"?'

Rees nodded approvingly. 'Good question. Hollerbach calculates that the right conditions must prevail: the right temperature and pressure, powerful gravitational gradients—'

'In the Core,' Nead breathed. 'I see. So perhaps—'

There was a soft boom.

The Bridge shifted slightly, as if a wave were passing through its structure. The image in the monitor broke up.

Rees twisted. A sharp smell of burning, of smoke, touched his nostrils. The Scientists were milling in confusion, but the instruments seemed to be intact. Somewhere someone screamed.

Fear creased Nead's brow. 'Is that normal?'

'That came from the Library,' Rees murmured. 'And, no, it's not bloody normal.' He took a deep, calming breath; and when he spoke again his voice was steady. 'It's all right, Nead. I want you to get out of here as quickly as you can. Wait until . . .' His voice tailed away.

Nead looked at him, half-understanding. 'Until what?'

'Until I send for you. Now move.'

The boy half-swam to the exit and pushed his way through the crowd of Scientists.

Trying to ignore the spreading panic around him, Rees ran his fingers over the keyboard of the Telescope, locking the precious instrument into its rest position. Briefly he marvelled at his own callous coolness. But in the end, he reflected, he was responding to a harsh, terrible truth. Humans could be replaced. The Telescope couldn't.

When he turned from the keyboard the Observatory was deserted. Paper and small tools lay scattered over the incorruptible floor, or floated in the equilibrium layer. And still that smell of burning hung in the air.

With a sense of lightness he crossed the chamber floor and climbed out into the corridor. Smoke thickened the air, stinging his eyes, and as he approached the Library images of the imploded foundry and of the Theatre of Light confused his thoughts, as if his mind were a Telescope focusing on the buried depths of the past.

Entering the Library was like climbing into an ancient, decayed mouth. Books and papers had been turned to blackened leaves and blasted against the walls; the ruined paper had been soaked through by the efforts of Scientists to save their treasure. There were three men still here, beating at smouldering pages with damp blankets. At Rees's entry one of them turned. Rees was moved to recognize Grye, tears streaking his blackened cheeks.

Rees ran a cautious finger over the shell of ruined books. How much had been lost this shift? - what wisdom that might have saved them all from

the Nebula’s smoky death?

Something crackled under his feet. There were shards of glass scattered over the floor, and Rees made out the truncated, smoke-stained neck of a wine-sim bottle. Briefly he found himself marvelling that such a simple invention as a bottle filled with burning oil could wreak so much damage.

There was nothing he could do here. He touched Grye’s shoulder briefly; then he turned and left the Bridge.

There was no sign of security guards at the door. The scene outside was chaotic. Rees had a blurred impression of running men, of flames on the horizon; the Raft was a panorama of fists and angry voices. The harsh starlight from above flattened the scene, making it colourless and gritty.

So it had come. His last hope that this incident might be restricted to just another attack on the Labs evaporated. The fragile web of trust and acceptance that had held the Raft together had finally collapsed . . .

A few dozen yards away he made out a group of youths surrounding a bulky man; Rees thought he recognized Captain Mith. The big man went down under a hail of blows. At first, Rees saw, he tried to defend his head, his crotch; but blood spread rapidly over his face and clothing, and soon fists and feet were pounding into a shapeless, unresisting bulk.

Rees turned his head away.

In the foreground a small group of Scientists sat numbly on the deck, staring into the distance. They surrounded a bundle which looked like a charred row of books - perhaps something recovered from the fire?

But there was the white of bone amid the charring.

He felt his throat constrict; he breathed deeply, drawing on all his experience. This was not a good time to succumb to panic.

He recognized Hollerbach. The old Chief Scientist sat a little apart from the rest, staring at the crumpled remains of his spectacles. He looked up as Rees approached, an almost comical mask of soot surrounding his eyes. ‘Eh? Oh, it’s you, boy. Well, this is a fine thing, isn’t it?’

‘What’s happening, Hollerbach?’

Hollerbach toyed with his glasses. ‘Look at this. Half a million shifts old, these were, and absolutely irreplaceable. Of course, they never worked —’ He looked up vaguely. ‘Isn’t it obvious what’s happening?’ he snapped with something of his former vigour. ‘Revolution. The frustration, the

hunger, the privations - they're lashing out at what they can reach. And that's us. It's so damn stupid—'

Unexpected anger flared in Rees. 'I'll tell you what's stupid. You people keeping the rest of the Raft - and my own people on the Belt - in ignorance and hunger. That's what's stupid . . .'

Hollerbach's eyes in their pools of wrinkles looked enormously tired. 'Well, you may be right, lad; but there's nothing I can do about it now, and there never was. My job was to keep the Raft intact. And who's going to do that in the future, eh?'

'Mine rat.' The voice behind him was breathless, almost cracked with exhilaration. Rees whirled. Gover's face was flushed, his eyes alive. He had torn the braids from his shoulders and his arms were bloodstained to the elbows. Behind him a dozen or more young men approached; as they studied the Officers' homes their faces were narrow with hunger.

Rees found his fists bunching - and deliberately uncurled them. Keeping his voice level he said, 'I should have turned you in while I had the opportunity. What do you want, Gover?'

'Last chance, rat,' Gover said softly. 'Come with us now, or take what we dish out to these vicious old farts. One chance.'

The stares of Gover and Hollerbach were almost palpable pressures: the stink of smoke, the noise, the bloodied corpse on the deck, all seemed to converge in his awareness, and he felt as if he were bearing on his back the weight of the Raft and all its occupants.

Gover waited.

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7

The rotation of the tethered tree was peaceful, soothing. Pallis sat by the warm trunk of the tree, chewing slowly on his flight rations. A head and shoulders thrust their way through the mat of foliage. It was a young man; his hair was filthy and tangled and sweat plastered a straggling beard to his throat. He looked about uncertainly.

Pallis said softly: ‘I take it you’ve a good reason for disturbing my tree, lad. What are you doing here?’

The visitor pulled himself through the leaves. Pallis noticed how the boy’s coverall bore the scars of recently removed braids. Shame, Pallis reflected, that the coverall itself hadn’t been removed - and washed - with equal vigour.

‘Regards to you, tree-pilot. My name’s Boon, of the Brotherhood of the Infrastructure. The Committee instructed me to find you—’

‘I don’t care if Boney Joe himself shoved a fibula up your arse to help you on your way,’ Pallis said evenly. ‘I’ll ask you again. What are you doing in my tree?’

Boon’s grin faded. ‘The Committee want to see you,’ he said, his voice faint. ‘Come to the Platform. Now.’

Pallis cut a slice of meat-sim. ‘I don’t want anything to do with your damn Committee, boy.’

Boon scratched uncertainly at his armpit. ‘But you have to. The Committee . . . it’s an order—’ ‘All right, lad, you’ve delivered your message,’ Pallis snapped. ‘Now get out of my tree.’ ‘Can I tell them you’ll come?’

For reply Pallis ran a fingertip along the blade of his knife. Boon ducked back through the foliage.

Pallis buried the tip of the knife in trunk wood, wiped his hands on a dry leaf and pulled himself to the rim of the tree. He lay face-down among the fragrance of the leaves, allowing the tree’s stately rotation to sweep his gaze across the Raft.

Under its canopy of forest the deck had become a darker place: threads of smoke still rose from the ruins of buildings, and Pallis noticed dark stretches in the great cable-walled avenues. That was new; so they were smashing up the globe lamps now. How would it feel to smash the very last

one? he wondered. To extinguish the last scrap of ancient light - how would it feel to grow old, knowing that it was your hands that had done such a thing?

At the revolution's violent eruption Pallis had simply retreated to his trees. With a supply of water and food he had hoped to rest here among his beloved branches, distanced from the pain and anger washing across the Raft. He had even considered casting off, simply flying away alone. The Bones knew he owed no loyalty to either side in this absurd battle.

But, he mused, he was still a human. As were the running figures on the Raft - even the self-appointed Committee - and those lost souls in the Belt. And, when all this was over, someone would have to carry food and iron for them once more.

So he had waited above the revolt, hoping it would leave him be . . .

But now his interlude was over.

He sighed. So, Pallis, you can hide from their damn revolution, but it looks as if it isn't going to hide from you.

He had to go, of course. If not they'd come for him with their bottles of burning oil . . .

He took a deep draught of water, tucked his knife in his belt and slid smoothly through the foliage.

He made his way to an avenue and set off towards the Rim. The avenue was deserted.

Shivering, he found himself listening for echoes of the crowds who had thronged along here not many shifts ago. But the silence of the wide thoroughfare was deep, eerie. The predominant smell was of burnt wood, overlaid with a meat-like stickiness; he turned up his face to the calm canopy of forest, nostrils seeking the soft wood-scented breeze from the branches.

As he had suspected a good fraction of the globe lamps hung in imploded fragments from their cables, dooming the avenue to half-light. The Raft had become a place of moody darkness, the blanket of shadows lifting here and there to reveal glimpses of this fine new world. He saw a small child licking at the remains of a long-empty food pallet. He made out a shape hanging from rope tied to the tree cables; a pool of something brown and thick had dried on the deck beneath it—

Pallis felt the food churn in his stomach. He hurried on.

A group of young men came marching from the direction of the Platform, braids ostentatiously torn from their shoulders. Their eyes were wide with joy; Pallis, despite his muscles, stood aside as they passed.

At length he reached the edge of the cable thicket and - with some relief - emerged to open sky. He made his way up the apparent slope to the Rim and at last climbed the broad, shallow stairs to the Platform. Incongruous memories tugged at him. He hadn't been here since his Thousandth Shift dance. He remembered the glittering costumes, the laughter, the drink, his own big-boned awkwardness . . .

Well, he wouldn't find a party here today.

At the head of the stairs two men blocked the way. They were about Pallis's size but somewhat younger; dim hostility creased their features.

'I'm Pallis,' he said. 'Woodsman. I'm here to see the Committee.'

They studied him suspiciously.

Pallis sighed. 'And if you two boneheads will get out of the way I can do what I came for.'

The shorter of the two - a square, bald man - took a step up to him. Pallis saw he was carrying a club of wood. 'Listen—'

Pallis smiled, letting his muscles bunch under his shirt.

The taller doorman said, 'Leave it, Seel. He's expected.'

Seel scowled; then he hissed: 'Later, funny man.'

Pallis let his smile broaden. 'My pleasure.'

He pushed past the doormen and down to the body of the Platform, wondering at his own actions. Now, what had been the point of antagonizing those two? Was violence, the pounding of fist into bone, so attractive a release?

A fine response to these unstable times, Pallis.

He walked slowly towards the centre of the Platform. The place was barely recognizable from former times. Food cartons lay strewn about the deck, no more than half emptied; at the sight of the spoiling stuff Pallis remembered with a flash of anger the starving child not a quarter of a mile from here.

Trestle tables studded the Platform. They bore trophies of various kinds - photographs, uniforms, lengths of gold braid, a device called an orrery Pallis remembered seeing in Hollerbach's office - but also books, charts,

listings and heaps of paper. It was clear that such government as still existed on the Raft was based here.

Pallis grinned sourly. It had been a great symbolic gesture, no doubt, to remove control from the corrupt centre of the Raft and take it out to this spectacular vantage spot . . . But what if it rained on all this paperwork?

However, no one seemed too concerned about such practicalities at the moment, or indeed about the machineries of government in general. Save for a group of subdued, grubby Scientists huddled together at the centre of the deck, the Platform's population was clustered in a tight knot at the Nebula-facing wall. Pallis approached slowly. The Raft's new rulers, mostly young men, laughed and passed bottles of liquor from hand to hand, gaping at some attraction close to the wall.

'Hello, tree-pilot.' The voice was insolent and unpleasantly familiar. Pallis turned. Gover stood facing him, hands on hips, a grin on his thin face.

'Gover. Well, surprise, surprise. I should have expected you here. You know what they say, eh?'

Gover's smile faded.

'Stir a barrel of shit: what rises to the top?'

Gover's lower lip trembled. 'You should watch it, Pallis. Things have changed on this Raft.'

Pallis inquired pleasantly: 'Are you threatening me, Gover?'

For long seconds the younger man held his gaze; then he dropped his eyes - just a flicker, but enough for Pallis to know he had won.

He let his muscles relax, and the glow of his tiny triumph faded quickly. Two threatened fist-fights in as many minutes? Terrific.

Gover said, 'You took long enough to get here.'

Pallis allowed his gaze to roam. He murmured, 'I'll not speak to the puppet if I know whose hand is working him. Tell Decker I'm here.'

Gover flushed with frustration. 'Decker's not in charge. We don't work like that—'

'Of course not,' Pallis said tiredly. 'Just fetch him. All right?' And he turned his full attention on the excited group near the edge.

Gover stalked away.

His height allowed Pallis a view over the milling crowd. They were clustered around a crude breach in the Platform's glass wall. A chill breeze swept over the lip of the deck; Pallis - despite his flying experience - found

his stomach tightening at the thought of approaching that endless drop. A metal beam a few yards long had been thrust through the breach and out over the drop. A young man stood on the beam, his uniform torn and begrimed but still bearing Officer's braids. He held his head erect, so bloodied that Pallis failed to recognize him. The crowd taunted the Officer, laughing; fists and clubs poked at his back, forcing him to take one step after another along the beam.

'You wanted to see me, tree-pilot?'

Pallis turned. 'Decker. Long time no see.'

Decker nodded. His girder-like frame was barely contained by coveralls that were elaborately embroidered with black thread, and his face was a broad, strong mask contoured by old scars.

Pallis pointed to the young Officer on the beam. 'Why don't you stop this bloodiness?'

Decker smiled. 'I have no power here.'

'Balls.'

Decker threw his head back and laughed.

Decker was the same age as Pallis; they had grown up boyhood rivals, although Pallis had always considered the other his superior in ability. But their paths as adults had soon parted. Decker had never been able to accept the discipline of any Class, and so had descended, frustrated, into Infrastructure. With time Pallis's face had grown a mask of tree scars, while Decker's had become a map drawn by dozens of fists, boots and knives . . .

But he had always given more than he had taken. And slowly he had grown into a position of unofficial power: if you wanted something done fast you went to Decker . . . So Pallis knew who would emerge smiling from this revolt, even if Decker himself hadn't instigated it.

'All right, Pallis,' Decker said. 'Why did you ask to see me?'

'I want to know why you and your band of bloodthirsty apprentices dragged me from my tree.'

Decker rubbed his greying beard. 'Well, I can only act as a spokesman for the Interim Committee, of course—'

'Of course.'

'We have some shipments to be taken to the Belt. We need you to lead the flight.'

'Shipments? Of what?'

Decker nodded towards the huddle of Scientists. ‘That lot for a start. Labour for the mine. Most of them anyway; we’ll keep the young, healthy ones.’

‘Very noble.’

‘And you’re to take a supply machine.’

Pallis frowned. ‘You’re giving the Belt one of our machines?’

‘If you read your history you’ll find they have a right, you know.’

‘Don’t talk to me about history, Decker. What’s the angle?’

Decker pursed his lips. ‘The upswelling of popular affection on this Raft for our brothers in the Belt is, shall we say, not to be opposed at present by the prudent man.’

‘So you’re pleasing the crowd. But if the Raft loses its economic advantage over the Belt you’ll lose out too.’

Decker smiled. ‘I’ll make that leap when I come to it. It’s a long flight to the Belt, Pallis; you know that as well as anybody. And a lot can happen between here and there.’

‘You’d deliberately lose one of our machines? By the Bones, Decker—’

‘I didn’t say that, old friend. All I meant was that the transportation of a machine by a tree - or a fleet of trees - is an enormous technical challenge for your woodsmen.’

Pallis nodded. Decker was right, of course; you’d have to use a flight of six or seven trees with the machine suspended between them. He’d need his best pilots to hold the formation all the way to the Belt . . . names and faces passed through his thoughts . . .

And Decker was grinning at him. Pallis frowned, irritated. All a man like Decker had to do was throw him an interesting problem and everything else went out of his head.

Decker turned to watch the activities of his co-revolutionaries.

The young Officer had been pushed a good yard beyond the glass wall. Tears mingled with the blood caked over his cheeks and, as Pallis watched, the lad’s bladder released; a stain gushed around his crotch, causing the crowd to roar.

‘Decker—’

‘I can’t save him,’ Decker said firmly. ‘He won’t discard his braids.’

‘Good for him.’

‘He’s a suicidal idiot.’

Now a figure broke out of the ranks of cowering Scientists. It was a young, dark man. He cried: ‘No!’ and, scarred fists flailing, he launched himself at the backs of the crowd. The Scientist soon disappeared under a hail of fists and boots; at last he too was thrust, bloodied and torn, onto the beam. And through the fresh bruises, dirt and growth of beard, Pallis realized with a start that he recognized the impetuous young man.

‘Rees,’ he breathed.

Rees faced the baying, upturned faces, head ringing from the blows he had taken. Over the heads of the crowd he could see the little flock of Scientists and Officers; they clung together, unable even to watch his death.

The Officer leaned close and shouted through the noise. ‘I ought to thank you, mine rat.’

‘Don’t bother, Doav. It seems I’m not ready yet to watch a man die alone. Not even you.’

Now fists and clubs came prodding towards them. Rees took a cautious step backwards. Had he travelled so far, learned so much . . . only for it to end like this?

. . . He recalled the time of revolution, the moment he had faced Gover outside the Bridge. As he had sat among the Scientists, signifying where his loyalties lay, Gover spat on the deck and turned his back.

Hollerbach had hissed: ‘You bloody young idiot. What do you think you are doing? The important thing is to survive . . . If we don’t resume our work, a revolution every other shift won’t make a damn bit of difference.’

Rees shook his head. There was logic in Hollerbach’s words - but surely there were some things more important than mere survival. Perhaps when he was Hollerbach’s age he would see things differently . . .

As the shifts had worn away he had been deprived of food, water, shelter and sleep, and had been forced to work on basic deck maintenance tasks with the most primitive of tools. He had suffered the successive indignities in silence, waiting for this darkness to clear from the Raft.

But the revolution had not failed. At last his group had been brought here; he suspected that some or all of them were now to be selected for some new trial. He had been prepared to accept his destiny—

—until the sight of the young Officer dying alone had cut through his carefully maintained patience.

Doav seemed calm now, accepting; he returned Rees's gaze with a nod. Rees extended his hand. The Officer gripped it firmly.

The two of them faced their tormentors.

Now a few young men climbed onto the beam, egged on by their companions. Rees fended off their clubs with his forearm, but he was forced to retreat, inch by inch.

Under his bare feet he felt an edge of metal, the coldness of empty air.

But someone was moving through the crowd.

Pallis had followed Decker through the mob, watching the deference the big man was accorded with some amusement. At the wall Decker said, 'So now we have two heroes. Eh?'

Laughter rippled.

'Don't you think this is a waste, though?' Decker mused loudly. 'You - Rees, is it? - we were going to keep you here. We need good muscles; there's enough work to be done. Now this stupidity of yours is going to leave us short . . . I'll tell you what. You. The Officer.' Decker beckoned. 'Come down and join the rest of the cowards over there.' There was a rumble of dissent; Decker let it pass, then said softly: 'Of course, this is just my suggestion. Is the will of the Committee opposed?'

Of course not. Pallis smiled.

'Come, lad.'

Doav turned uncertainly to Rees. Rees nodded and pushed him gently towards the Platform. The Officer walked gingerly along the beam and stepped down to the deck; he passed through the crowd towards the Scientists, enduring sly punches and kicks.

Rees was left alone.

'As for the mine rat—' An anticipatory roar rose from the crowd. Decker raised his hands for silence. 'As for him I can think of a much tougher fate than jumping off that plate. Let's send him back to the Belt! He's going to need all his heroism to face the miners he ran out on—'

His words were drowned by a shout of approval; hands reached out and hauled Rees from the beam.

Pallis murmured, 'Decker, if I thought it would mean anything I'd thank you.'

Decker ignored his words. 'Well, pilot; will you fly your tree as the Committee request?'

Pallis folded his arms. ‘I’m a pilot, Decker; not a gaoler.’

Decker raised his eyebrows; the scars patterned across his cheeks stretched white. ‘Of course it’s your choice; you’re a citizen of the Free Raft. But if you don’t take this Science rabble I don’t know how we’ll manage to keep feeding them.’ He sighed with mock gravity. ‘At least in the Belt they might have some chance. Here, though - times are hard, you see. The kindest thing might be to throw them over that edge right now.’ He regarded Pallis with empty, black eyes. ‘What do you say, pilot? Shall I give my young friends some real sport?’

Pallis found himself trembling. ‘You’re a bastard, Decker.’

Decker laughed softly.

It was time for the Scientists to board the tree. Pallis made one last tour of the rim, checking the supply modules lashed to the shaped wood.

Two Committee men pulled themselves unceremoniously through the foliage, dragging a rope behind them. One of them, young, tall and prematurely bald, nodded to him. ‘Good shift, pilot.’

Pallis watched coldly, not deigning to reply.

The two braced their feet on the branches, spat on their hands, and began to haul on the rope. At length a bundle of filthy cloth was dragged through the foliage. The two men dumped the bundle to one side, then removed the rope and passed it back through the foliage.

The bundle uncurled slowly. Pallis walked over to it.

The bundle was a human, a man bound hand and foot: a Scientist, to judge by the remnants of crimson braid stitched to the ragged robes. He struggled to sit up, rocking his bound arms. Pallis reached down, took the man’s collar and hauled him upright. The Scientist looked up with dim gratitude; through matted dirt Pallis made out the face of Cipse, once Chief Navigator.

The Committee men were leaning against the trunk of his tree, evidently waiting for their rope to be attached to the next ‘passenger’. Pallis left Cipse and walked across to them. He took the shoulder of the bald man and, with a vicious pressure, forced the Committee man to face him.

The bald man eyed him uncertainly. ‘What’s the problem, pilot?’

Through clenched teeth Pallis said: ‘I don’t give a damn what happens down there, but on my trees what I say goes. And what I say is that these

men are going to board my tree with dignity.' He dug his fingers into the other's flesh until cartilage popped.

The bald man squirmed away from his grip. 'All right, damn it; we're just doing our job. We don't want any trouble.'

Pallis turned his back and returned to Cipse. 'Navigator, welcome aboard,' he said formally. 'I'd be honoured if you would share my food.'

Cipse's eyes closed and his soft body was wracked by shudders.

Slowly the flight of trees descended into the bowels of the Nebula. Before long the Belt hovered in the sky before them; gloomily Rees studied the chain of battered boxes and piping turning around the fleck of rust that was the star core. Here and there insect-like humans crawled between the cabins, and a cloud of yellowish smoke, emitted by the two foundries, hung about the Belt like a stain in the air.

Numbly he worked at the fire bowls. This was a nightmare: a grim parody of his hope-filled voyage to the Raft, so many shifts ago. During his rest periods he avoided the other Scientists. They clung to each other in a tight circle around Grye and Cipse, barely talking, doing only what they were told.

These were supposed to be men of intelligence and imagination, Rees thought bitterly; but then, he reflected, their future did not exactly encourage the use of the imagination, and he did not have the heart to blame them for turning away from the world.

His only, slight, pleasure was to spend long hours at the trunk of the tree, staring across the air at the formation which hung a few hundred yards above him. Six trees turned at the corners of an invisible hexagon; the trees were in the same plane and were close enough for their leaves to brush, but such was the skill of the pilots that scarcely a twig was disturbed as they descended through miles of air. And suspended beneath the trees, in a net fixed by six thick ropes, was the boxy form of a supply machine. Rees could see the remnants of Raft deck plates still clinging to the base of the machine.

Even now the flight was a sight that lifted his heart. Humans were capable of such beauty, such great feats . . .

The Belt became a chain of homes and factories. Rees saw half-familiar faces turned up towards their approach like tiny buttons.

Pallis joined him at the trunk. ‘So it ends like this, young miner,’ he said gruffly. ‘I’m sorry.’

Rees looked at him in some surprise; the pilot’s visage was turned towards the approaching Belt, his scars flaring. ‘Pallis, you’ve nothing to be sorry about.’

‘I’d have done you a kindness if I’d thrown you off when you first stowed away. They’ll give you a hard time down there, lad.’

Rees shrugged. ‘But it won’t be as hard as for the rest of them.’ He jabbed a thumb towards the Scientists. ‘And remember I had a choice. I could have joined the revolution and stayed on the Raft.’

Pallis scratched his beard. ‘I’m not sure I understand why you didn’t. The Bones know I’ve no sympathy with the old system; and the way your people had been kept down must have made you burn.’

‘Of course it did. But . . . I didn’t go to the Raft to throw fuel bombs, tree-pilot. I wanted to learn what was wrong with the world.’ He smiled. ‘Modest, wasn’t I?’

Pallis lifted his face higher. ‘You were damn right to try, boy. Those problems you saw haven’t gone away.’

Rees cast a glance around the red-stained sky. ‘No, they haven’t.’

‘Don’t lose hope,’ Pallis said firmly. ‘Old Hollerbach’s still working.’

Rees laughed. ‘Hollerbach? They won’t shift him. They still need someone to run things in there - find them the repair manuals for the supply machines, maybe try to move the Raft from under the falling star - and besides, I think even Decker’s afraid of him . . .’

Now they laughed together. They remained by the trunk for long minutes, watching the Belt approach.

‘Pallis, do something for me.’

‘What?’

‘Tell Jaen I asked about her.’

The tree-pilot rested his massive hand on Rees’s shoulder. ‘Aye, lad. She’s safe at present - Hollerbach got her a place on his team of assistants - and I’ll do what I can to make sure she stays that way.’

‘Thanks. I—’

‘And I’ll tell her you asked.’

A rope uncurled from the trunk of the tree and brushed against the Belt’s rooftops. Rees was the first to descend. A miner, half his face ruined

by a massive purple burn, watched him curiously. The Belt's rotation was carrying him away from the tree; Rees pulled himself after the trailing rope and assisted a second Scientist to lower himself to the rooftops.

Soon a gaggle of Scientists were stumbling around the Belt after the dangling rope. A cluster of Belt children followed them, eyes wide in thin faces.

Rees saw Sheen. His former supervisor hung from a cabin, one brown foot anchored in rope; she watched the procession with a broad grin.

Rees let the clumsy parade move on. He worked his way towards Sheen; fixing his feet in the rope he straightened up and faced her.

'Well, well,' she said softly. 'We thought you were dead.'

He studied her. The heat-laden pull of her long limbs still called uncomfortably; but her face was gaunt, her eyes lost in pools of shadow. 'You've changed, Sheen.'

She spat laughter. 'So has the Belt, Rees. We've seen hard times here.'

He narrowed his eyes. Her voice was almost brutal, edged with despair. 'If you've the brains I once believed you had,' he snapped, 'you'll let me help. Let me tell you some of what I've learned.'

She shook her head. 'This isn't a time for knowledge, boy. This is a time to survive.' She looked him up and down. 'And believe me, you and the rest of your flabby colleagues are going to find that quite tough enough.'

The absurd, shambling procession, still following the tree rope, had almost completed an orbit of the Belt.

Rees closed his eyes. If only this mess would all go away; if only he were allowed to get back to his work—

'Rees!' It was Cipse's thin voice. 'You've got to help us, man; tell these people who we are . . .'

Rees shook off his despair and pulled himself across the rooftops.

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8

The winch mechanism impelled the chair towards the star kernel. Rees closed his eyes, relaxed his muscles and tried to blank out his mind.

To get through the next shift: that was his only priority now. Just one shift at a time . . .

If the exile to the Belt had been a descent into hell for Grye, Cipse and the rest, for Rees it had been the meticulous opening of an old wound. Every detail of the Belt - the shabby cabins, the rain hissing over the surface of the kernel - had crowded into his awareness, and it was as if the intervening thousands of shifts on the Raft had never been.

But in truth he had changed forever. At least before he had had some hope . . . Now there was none.

The chair lurched. The dome of rust rocked beneath his feet and already he could sense the tightening pull of the star's gravity field.

The Belt had changed too, he mused . . . and for the worse. The miners seemed coarsened, brutalized, the Belt itself shabbier and less well maintained. He had learned that deliveries from the Raft had grown less and less frequent. As supplies failed to arrive a vicious circle had set in. Increasing illness and malnutrition and, in the longer term, higher mortality were making it ever harder for the miners to meet their quotas, and without iron to trade even less food could be bought from the Raft - which worsened the miners' conditions still further.

In such a situation, surely something had to give. But what? Even his old acquaintances - like Sheen - were reluctant to talk, as if there was some shameful secret they were hiding. Were the miners making some new arrangements, finding some other, darker, way to break out of the food trap? If so, what?

The wheels of his chair impacted the surface of the star and a full five gees descended on his chest, making him gasp. With a heavy hand he released the cable lock and allowed the chair to roll towards the nearest mine entrance.

'Late again, you feckless bastard.' The rumbling voice had issued from the gloom of the mine mouth.

'No, I'm not, Roch; and you know it,' Rees said calmly. He brought his chair to a halt at the head of the ramp leading down into the mine.

A chair came whirring up from the gloom. Despite the recent privations the miner Roch was still a huge man. His beard merged with the fur and sweat plastered across his chest; a stomach like a sack slumped over his belt. White showed around his eyes, and when he opened his mouth Rees could see stumps of teeth like burnt bones. ‘Don’t talk back, Raft man.’ Spittle sprayed his chest in tight parabolae. ‘What’s to stop me putting you all on triple shifts? Eh?’

Rees found the breath escaping from him in a slow sigh. He knew Roch of old. Roch, who you always avoided in the Quartermaster’s, whether he was drunk or not. Roch, the half-mad troublemaker who had only been allowed to grow past boyhood, Rees suspected, because of the size of his muscles.

Roch. The obvious choice as the Scientists’ shift supervisor.

He was still staring at Rees. ‘Well? Nothing to say? Eh?’

Rees held his tongue, but the other’s fury increased regardless.

‘What’s the matter, Raftshit? Scared of a little work? Eh? I’ll show you the meaning of work . . .’ Roch gripped the arms of his chair with fingers like lengths of rope; with separate, massive movements, he hauled his feet off their support plates and planted them on the rust.

‘Oh, by the Bones, Roch, you’ve made your point,’ Rees protested. ‘You’ll kill yourself—’

‘Not me, Raftshit.’ Now Roch’s biceps tightened so that Rees could see the structure of the muscles through the sweat-streaked skin. Slowly, grunting, Roch lifted his bulk from the chair, knees and calves shaking under the load. At last he stood, swaying minutely, arms raised for balance. Five gees hauled at his stomach so that it looked like a sack of mercury slung over his belt; Rees almost cringed as he imagined how the belt must be biting into Roch’s flesh.

A grin cracked Roch’s purpling face. ‘Well, Raft man?’ Now his tongue protruded from his lips. With slow deliberation he raised his left foot a few inches from the surface and shoved it forward; then the right, then the left again; and so, like a huge, grotesque child, Roch walked on the surface of the star.

Rees watched, not trusting himself to speak.

At length Roch was satisfied. He grabbed the chair arms and lowered himself into the seat. He stared at Rees challengingly, his humour

apparently restored by his feat. ‘Well, come on, Raftshit, there’s work to do. Eh?’

And he turned his chair and led the way into the interior of the star.

Most of the Scientists’ work assignments were inside the star mine. For some imagined misdemeanour Roch had long since put them all on double shift. They were allowed an hour’s break between shifts - even Roch had not denied them that yet - and when the break came Rees met Cipse beneath the glow of a globe lamp.

The Scientists sat in companionable silence for a while. They were in one of the porous kernel’s larger chambers; lamps were scattered over its roof like trapped stars, casting light over piles of worked metal and the sullen forms of Moles.

The Navigator looked like a pool of fat in his wheelchair, his small features and short, weak limbs mere addenda to his crushed bulk. Rees, with some effort, helped him raise a tube of water to his lips. The Navigator dribbled; the water scattered over the ruin of his coverall and droplets hit the iron floor like bullets. Cipse smiled apologetically. ‘I’m sorry,’ he said, wheezing.

Rees shook his head. ‘Don’t worry about it.’

‘You know,’ Cipse said at length, ‘the physical conditions down here are poor enough; but what makes it unendurable is . . . the sheer boredom.’

Rees nodded. ‘There has never been much to do save supervise the Moles. They can make their own decisions, mostly, with occasional human intervention. Frankly, though, one or two experienced miners can run the whole kernel. There’s no need for so many of us to be down here. It’s just Roch’s petty way of hurting us.’

‘Not so petty.’ Cipse’s breath seemed to be laboured; his words were punctuated by pauses. ‘I’m quite concerned about the . . . health of some of the others, you know. And I suspect . . . suspect that we would actually be of more use in some other role.’

Rees grimaced. ‘Of course. But try telling Roch.’

‘You know I’ve no wish to appear insulting, Rees, but you clearly have more in . . . common with these people than the . . . the rest of us.’ He coughed and clutched his chest. ‘After all, you are one of them. Can’t you . . . say something?’

Rees laughed softly. ‘Cipse, I ran out of here, remember. They hate me more than the rest of you. Look, things will get better, I’m sure of that; the miners aren’t barbarians. They’re just angry. We must be patient.’

Cipse fell silent, his breath shallow.

Rees stared at the Navigator in the dim light. Cipse’s round face was white and slick with sweat. ‘You say you’re concerned about the wellbeing of the others, Navigator, but what about yourself?’

Cipse massaged the flesh of his chest. ‘I can’t admit to feeling wonderful,’ he wheezed. ‘Of course, just the fact of our presence down here - in this gravity field - places a terrible strain on our hearts. Human beings weren’t designed, it seems, to function in . . . such conditions.’

‘How are you feeling? Do you have any specific pain?’

‘Don’t fuss, boy,’ Cipse snapped with the ghost of his old tetchiness. ‘I’m perfectly all right. And I am the most senior of us, you know. The others . . . rely on me . . .’ His words were lost in a fit of coughing.

‘I’m sorry,’ Rees said carefully. ‘You’re the best judge, of course. But - ah - since your wellbeing is so vital to our morale, let me help you, for this one shift. Just stay here; I think I can handle the work of both of us. And I can keep Roch occupied. I’m afraid there’s no way he’ll let you off the star before the end of the shift, but perhaps if you sit still - try to sleep even—’

Cipse thought it over, then said weakly, ‘Yes. It would feel rather good to sleep.’ He closed his eyes. ‘Perhaps that would be for the best. Thank you, Rees . . .’

‘No, I don’t know what’s wrong with him,’ Rees said. ‘You’re the one with bio training, Grye. He hardly woke up when it came time to return him to the surface. Maybe his heart can’t stand up to the gravity down there. But what do I know?’

Cipse lay strapped loosely to a pallet, his face a bowl of perspiration. Grye hovered over the still form of the Navigator, his hands fluttering against each other. ‘I don’t know; I really don’t know,’ he repeated.

The four other Scientists of the group formed an anxious backdrop. The tiny cabin to which they’d all been assigned seemed to Rees a cage of fear and helplessness. ‘Just think it through,’ he said, exasperated. ‘What would Hollerbach do if he were here?’

Grye drew in his stomach pompously and glowered up at Rees. ‘May I point out that Hollerbach isn’t here? And furthermore, on the Raft we had

access to dispensers of the finest drugs - as well as the Ship's medical records. Here we have nothing, not even full rations—'

'Nothing except yourselves!' Rees snapped.

A circle of round, grime-streaked faces stared at him, apparently hurt.

Rees sighed. 'I'm sorry,' he said. 'Look, Grye, there's nothing I can suggest. You must have learned something in all the years you worked with those records. You'll simply have to do what you think best.'

Grye frowned, and for long seconds studied Cipse's recumbent form; then he began to loosen the Navigator's clothing.

Rees turned away. With his duty fulfilled, claustrophobia swiftly descended on him, and he pushed his way out of the cabin.

He prowled the confines of the Belt. He met few people: it was approaching mid-shift and most Belt folk must be at work or in their cabins. Rees breathed lungfuls of Nebula air and gloomily studied the over-familiar details of the little colony's construction: the battered cabins, walls scarred by generations of passing hands and feet, the gaping nozzles of the roof jets.

A breeze brought him a distant scent of wood, and he looked up. Hanging in the sky in tight formation was the flight of trees which had brought him here from the Raft. The bulk of the supply machine was still slung between them, and Rees made out Pallis's overseer tree hovering in the background. The elegant trees, the faint foliage scent, the figures clambering through the branches: the airy spectacle was quite beautiful, and it brought home to Rees with a sudden, sharp impact the magnitude of what he had lost in returning here.

The rotation of the Belt swept the formation over a horizon of cabins. Rees turned away.

He came to the Quartermaster's. Now the smell of stale alcohol filled his head and on impulse he slid into the bar's gloomy interior. Maybe a couple of shots of something tough would help his mood; relax him enough to get the sleep he needed—

The barman, Jame, was rinsing drink bowls in a bag of grimy water. He scowled through his grey-tinged beard. 'I've told you before,' he growled. 'I don't serve Raft shite in here.'

Rees hid his anger under a grin. He glanced around the bar; it was empty save for a small man with a spectacular burn scar covering one

complete forearm. ‘Looks like you don’t serve anyone else either,’ Rees snapped.

Jame grunted. ‘Don’t you know? This shift they’re finally going to offload that supply machine from the trees; that’s where all the able bodies are. Work to do, see - not like you feckless Raft shite—’

Rees felt his anger uncoil. ‘Come on, Jame. I was born here. You know that.’

‘And you chose to leave. Once a Rafter, always a Rafter.’

‘Jame, it’s a small Nebula,’ Rees snapped. ‘I’ve seen enough to teach me that much at least. And we’re all humans in it together, Belt and Raft alike—’

But Jame had turned his back.

Rees, irritated, left the bar. It had been - how long? a score of shifts? - since their arrival at the Belt, and the miners had only just worked out how to unship the supply device. And he, Rees, with experience of tree flight and of Belt conditions, hadn’t even been told they were doing it . . .

He anchored his toes in the wall of the Quartermaster’s and stretched to his full height, peering at the formation of trees beyond the far side of the Belt. Now that he looked more carefully he could see there were many people clinging awkwardly to the branches. Men swarmed over the net containing the supply device, dwarfed by its ragged bulk; they tied ropes around it and threw out lengths that uncoiled towards the Belt.

At last a loose web of rope trailed from the machine. Tiny shouts crossed the air; Rees could see the pilots standing beside the trunks of the great trees, and now billows of smoke bloomed above the canopies. With massive grandeur the trees’ rotation slowed and they began to inch towards the Belt. The coordination was skilful; Rees could see how the supply machine barely rocked through the air.

The actual transfer to the Belt would surely be the most difficult part. Perhaps the formation would move to match the Belt’s rotation, so that the dangling ropes could be hauled in until the machine settled as a new component of the chain of buildings. Presumably that was how much of the Belt had been constructed - though generations ago . . .

One tree dropped a little too fast. The machine rocked. Workers cried out, clinging to the nets. Tree-pilots called and waved their arms. Slowly the smoke over the offending tree thickened and the formation’s motion slowed.

Damn it, thought Rees furiously, he should be up there! He was still strong and able despite the poor rations and back-crushing work—

With a distant, slow rip, the net parted.

Rees, wrapped in introspective anger, took a second to perceive the meaning of what he saw. Then all of his being seemed to lock on that small point in the sky.

The pilots worked desperately, but the net became a mist of shreds and tatters; the formation dissolved in slow lurches of wood and smoke. Men wriggled in the air, rapidly drifting apart. The supply machine, freed of its constraints, hovered as if uncertain what to do. One man, Rees saw, was still clinging to the side of the machine itself.

The machine began to fall; soon it was sailing towards the Belt in a slow curve.

Rees dropped to hands and knees and clung tightly to the Belt cables. Where was the damn thing headed? The gravity fields of both star kernel and Nebula Core were hauling at the machine; the Core field was by far the most powerful, but was the machine close enough to the star for the latter to predominate?

The machine could pass through the structure of the Belt like a fist through wet paper.

The immediate loss of life would be enormous, of course; and within minutes the Belt, its integrity gone, would be torn apart by its own spin. A ring-shaped cloud of cabins, trailing pipes, rope fragments and squirming people would disperse until at last each survivor would be alone in the air, facing the ultimate fall into the Core . . .

Or, Rees's insistent imagination demanded, what if the machine missed the Belt but went on to impact the star kernel? He recalled the craters left even by raindrops at the base of a five-gee gravity well; what would the roaring tons of the supply machine do? He imagined a great splash of molten iron which would spray out over the Belt and its occupants. Perhaps the integrity of the star itself would be breached . . .

The tumbling supply machine loomed over him; he stared up, fascinated. He made out details of dispenser nozzles and input keyboards, and he was reminded incongruously of more orderly times, of queuing for supplies at the Rim of the Raft. Now he saw the man who still clung to the machine's ragged wall. He was dark-haired and long-boned and he seemed

quite calm. For a moment his eyes locked with Rees's, and then the slow rotation of the machine took him from Rees's view.

The machine grew until it seemed close enough to touch.

Then, with heart-stopping slowness, it slid sideways. The great bulk whooshed by a dozen yards from the closest point of the Belt. As it neared the star kernel its trajectory curved sharply, and then it was hurled away, still tumbling.

Its human occupant a mote on its flank, its path slowly arcing downwards towards the Core, the machine dwindled into infinity.

Above Rees the six scattered trees began to converge. With shouted calls ropes were thrown to workers still stranded in the air.

As fear of a spectacular death faded, Rees began to experience the loss of the machine as an almost physical pain. Yet another fragment of man's tiny heritage lost through stupidity and blundering . . . And with every piece gone their chances of surviving the next few generations were surely shrinking even further.

Then he recalled what Pallis had told him of Decker's calculations. The revolution's subtle leader-to-be had hinted darkly that he had no fear of a loss of economic power over the Belt despite the planned gift of a supply machine. Was it possible that this act had been deliberate? Had lives been wasted, an irreplaceable device hurled away, all for some short-term political advantage?

Rees felt as if he were suspended over a void, as if he were one of the unfortunates lost in the catastrophe; but the depths were composed not of air but of the baseness of human nature.

At the start of the next shift Cipse was too weak to be moved; so Rees agreed with Grye and the rest that he should be left undisturbed in the Belt. When Rees reached the surface of the star kernel he told Roch the situation. He kept his words factual, his tone meek and apologetic. Roch glowered, thick eyebrows knotting, but he said nothing, and Rees made his way into the depths of the star.

At mid-shift he rode back to the surface for a break - and was met by the sight of Cipse. The Navigator was wrapped in a grimy blanket and was weakly reaching for the controls of a wheelchair.

Rees rattled painfully over the star's tiny hills to Cipse. He reached out and laid a hand as gently as possible on the Scientist's arm. 'Cipse, what the

hell’s going on? You’re ill, damn it; you were supposed to stay in the Belt.’

Cipse turned his eyes to Rees; he smiled, his face a bloodless white. ‘I didn’t get a lot of choice, I’m afraid, my young friend.’

‘Roch . . .’

‘Yes.’ Cipse closed his eyes, still fumbling for the controls of his chair.

‘You got something to say about it, Raftshit?’

Rees turned his chair. Roch faced him, his corrupted mouth spread into a grin.

Rees tried to compute a way through this - to search for a lever that might influence this gross man and save his companion - but his rationality dissolved in a tide of rage. ‘You bastard, Roch,’ he hissed. ‘You’re murdering us. And yet you’re not as guilty as the folk up there who are letting you do it.’

Roch assumed an expression of mock surprise. ‘You’re not happy, Raftshit? Well, I’ll tell you what—’ He hauled himself to his feet. Face purpling, massive fists bunched, he grinned at Rees. ‘Why don’t you do something about it? Come on. Get out of that chair and face me, right now. And if you can put me down - why, then, you can tuck your little friend up again.’

Rees closed his eyes. Oh, by the Bones—

‘Don’t listen to him, Rees.’

‘I’m afraid it’s too late, Cipse,’ he whispered. He gripped the arms of his chair and tensed his back experimentally. ‘After what I was stupid enough to say he’s not going to let me off this star alive. At least this way you have a chance—’

He lifted his left foot from its supporting platform; it felt as if a cage of iron were strapped to his leg. Now the right . . .

And, without giving himself time to think about it, with a single, vein-bursting heave he pushed himself out of his chair.

Pain lapped in great sheets over the muscles of his thighs, calves and back. For a terrible instant he thought he was going to topple forward, to smash face-down into the iron. Then he was stable. His breathing was shallow and he could feel his heart rattle in its cage of bones; it was as if he bore a huge, invisible weight strapped to his back.

He looked up and faced Roch, tried to force a grin onto his swollen face.

‘Another attempt at self-sacrifice, Rees?’ Cipse said softly. ‘Godspeed, my friend.’

Roch’s smile seemed easy, as if the five gees were no more than a heavy garment. Now he lifted one massive leg, forced it through the air and drove his foot into the rust. Another step, and another; at last he was less than a yard from Rees, close enough for Rees to smell the sourness of his breath. Then, grunting with the effort, he lifted one huge fist.

Rees tried to lift his arms over his head, but it was as if they were bound to his sides by massive ropes. He closed his eyes. For some reason a vision of the young, white stars at the fringe of the Nebula came to him; and his fear dissolved.

A shadow crossed his face.

He opened his eyes. He saw red sky - and pain lanced through his skull.

But he was alive, and the loading of the star’s five gees had gone. There was a cool surface at his back and neck; he ran his hands over it and felt the gritty surface of an iron plate. The plate juddered beneath him; his stomach tightened and he gagged, dry. His mouth was sour, his tongue like a piece of wood, and he wondered how long he had lain unconscious.

Cautiously he propped himself on one elbow. The plate was about ten feet on a side; over it had been cast a rough net to which he was tethered by a rope around his waist. A pile of roughly cut iron was fixed near the centre of the plate. The plate had one other occupant: the barman, Jame, who regarded Rees incuriously as he chewed on a piece of old-looking meat-sim. ‘You’re awake, then,’ he said. ‘I thought Roch had bust your skull wide open; you’ve been out for hours.’

Rees stared at him; then the plate gave another shudder. Rees sat up, testing the gravity - it was tiny and wavering - and looked around.

The Belt hung in the air perhaps half a mile away, surrounding its star kernel like a crude bracelet around a child’s wrist.

So he was flying. On a metal plate? Vertigo swept through him and he wrapped his fingers in the net.

At length he made his way slowly to the edge of the plate, ducked his head to the underside. He saw four jet nozzles fixed at the corners of the plate, the small drive boxes obviously taken from Belt rooftops. Occasionally, in response to tugs by Jame on control strings, the nozzles would spout steam and the plate would kick through the air.

So the miners had invented flying machines while he had been gone. Why, he wondered, did they need them all of a sudden?

He straightened up and sat once more facing Jame. Now the barman was sucking water from a globe; at first he acted as if unaware of Rees, but at length, with a hint of pity on his broad, bearded features, he passed Rees the globe.

Rees allowed the water to pour over his tongue, slide down his parched throat. He passed the globe back. ‘Come on, Jame. Tell me what’s going on. What happened to Cipse?’

‘Who?’

‘The Nav—The Scientist. The ill one.’

Jame looked blank. ‘One of them died down there. Heart packed up, I heard. A fat old guy. Is that who you mean?’

Rees sighed. ‘Yes, Jame; that’s who I mean.’

Jame studied him; then he pulled a bottle from his waistband, unstopped it and took a deep draught.

‘Jame, why aren’t I dead also?’

‘You should be. Roch thought he had killed you; that’s why he didn’t hit you any more. He had you hauled up and brought to the damn Quartermaster’s - can you believe it? - and then you started to groan a bit, move around. Roch was all for finishing you off there and then, but I told him, “Not in my bar, you don’t.” . . . Then Sheen showed up.’

Something like hope spread through Rees. ‘Sheen?’

‘She knew I was due to leave on this ferry so I guess that gave her the idea to get you off the Belt.’ Jame’s eyes slid past Rees. ‘Sheen is a decent woman. Maybe this was the only way she could think of to save you. But I’ll tell you, Roch was happy enough to send you out here. A slower, painful death for you; that’s what he thought he was settling for . . .’

‘What? Where are you taking me?’ Rees, confused, questioned Jame further; but the barman lapsed into silence, nursing his bottle.

Under Jame’s direction the little craft descended into the Nebula. The atmosphere became thicker, warmer, harder to breathe; it was like the air in a too-enclosed room. The Nebula grew dark; the enfeebled stars shone brightly against the gloom. Rees spent long hours at the lip of the plate, staring into the abyss below. In the darkness at the very heart of the Nebula

Rees fancied he could see all the way to the Core, as if he were back in the Observatory.

There was no way of telling the time; Rees estimated several shifts had passed before Jame said abruptly, ‘You mustn’t judge us, you know.’

Rees looked up. ‘What?’

Jame was nursing a half-finished bottle; he lay awkwardly against the plate, eyes misty with drink. ‘We all have to survive. Right? And when the shipments of supplies from the Raft dried up, there was only one place to go for food . . .’ He thumped his bottle against the plate and fixed Rees with a stare. ‘I opposed it, I can tell you. I said it was better that we should die than trade with such people. But it was a group decision. And I accept it.’ He waggled a finger at Rees. ‘It was the choice of all of us, and I accept my share of the responsibility.’

Rees stared, baffled, and Jame seemed to sober a little. Then surprise, even wonder, spread across the barman’s face. ‘You don’t know what I’m talking about, do you?’

‘Jame, I haven’t the faintest idea. Nobody told us exiles a damn thing —’ Jame half laughed, scratching his head. Then he glanced around the sky, picking out a few of the brighter stars, clearly judging the plate’s position. ‘Well, you’ll find out soon enough. We’re nearly there. Take a look, Rees. Below us, to my right somewhere—’

Rees turned onto his belly and thrust his face below the plate. At first he could see nothing in the direction Jame had indicated - then, squinting, he made out a small, dark speck of matter.

The hours wore on. Jame carefully adjusted the thrust from the jets. The speck grew to a ball the colour of dried blood. At length Rees made out human figures standing on or crawling over all sides of the ball, as if glued there; judging from their size the sphere must have been perhaps thirty yards wide.

Jame joined him. With absent-minded companionship he passed Rees his bottle. ‘Here. Now, look, boy; what you have to remember if you want to last here more than a half-shift is that these are human beings just like you and me . . .’

They were nearing the surface now. The sphere-world was quite crowded with people, adults and children; they went naked, or wore ragged

tunics, and were uniformly short, squat and well-muscled. One man stood under their little craft, watching their approach.

The surface of the worldlet was composed of sheets of something like dried cloth. Hair sprouted from it here and there. In one place the sheets were ripped, exposing the interior structure of the worldlet.

Rees saw the white of bone.

He took a shuddering pull at Jame's bottle.

The man below raised his head; his eyes met Rees's, and the Boney raised his arms as if in welcome.

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9

Jame brought the plate to a smooth landing on the crackling surface of the worldlet. Silently he set to work unlashing the batches of iron from the net. Rees clung to the net and stared wildly around. The cramped horizon was made up of sheets of hairy, brownish material, stirring sluggishly. Again Rees saw the white of bone protruding through breaks in the surface.

He felt his bladder loosen. He closed his eyes and clamped down. Come on, Rees; you've faced greater perils than this, more immediate dangers . . .

But the Boneys were a myth from his childhood, sleep-time monsters to frighten recalcitrant children. Surely, in a universe which contained the calm, machined interior of the Bridge, there was no room for such ugliness?

'Welcome,' a high, dry voice said. 'So you've yet another guest for us, Jame?' The man Rees had seen from the air was standing over the plate now, accepting an armful of iron from Jame. A few conventional-looking food packages were stacked at the man's feet. Briskly Jame bundled them onto the plate and fixed them to the net.

The Boney was squat and barrel-chested, his head a wrinkled, hairless globe. He was dressed in a crudely cut sheet of surface material. He grinned and Rees saw that his cavernous mouth was totally without teeth. 'What's the matter, boy? Aren't you going to give old Quid a hand?'

Rees found his fingers tightening about the strands of the net. Jame stood over him with a package of iron. 'Come on, lad. Take this stuff and get off the plate. You haven't any choice, you know. And if you show you're afraid it will go the worse for you.'

Rees felt a whimper rising in his throat; it was as if all the revolting speculation he had ever heard about the Boneys' way of life had returned to unman him.

He clamped his lips together. Damn it, he was a Scientist Second Class. He summoned up the steady, tired gaze of Hollerbach. He would come through this. He had to.

He untwined his fingers from the netting and stood up, forcing the rational half of his mind to work. He felt heavy, sluggish; the gravity was perhaps one and a half gee. So the mass of the little planet must have been - what? Fifty tons?

He took the iron and, without hesitation, stepped off the plate and onto the surface. His feet sank a few inches into the stuff. It was soft, like a coarse cloth, and covered with hair strands which scratched his ankles; and, oh, it was warm, like the hide of some huge animal—

Or human.

Now, to his horror, his bladder released; dampness slid down his legs.

Quid opened his toothless mouth and roared with laughter.

Jame, from the security of the plate, said: ‘There’s no shame, lad. Remember that.’

The strange trade was over, and Jame worked his controls. With a puff of hot steam the plate lifted, leaving four charred craters in the soft surface. Within a few seconds the plate had dwindled into a fist-sized toy in the air.

Rees dropped his eyes. His urine had formed a pool about his feet and was seeping into the surface.

Quid stepped towards him, his footsteps crunching. ‘You’re a Boney now, lad! Welcome to the arsehole of the Nebula.’ He gestured to the puddle at Rees’s feet. ‘And I wouldn’t worry about that.’ He grinned and licked his lips. ‘You’ll be glad of it when you’re a bit thirstier . . .’

Foul speculations ran through Rees’s mind; he shuddered, but kept his gaze steady on Quid. ‘What do I do now?’

Again Quid laughed. ‘Well, that’s up to you. Stand here and wait for a ride that will never come. Or follow me.’ He winked and, the iron under his arm, strode away across the yielding surface.

Rees stood there for a few seconds, reluctant to leave even the faint shadow of his link with the world away from this place. But he really had no option; this grotesque character was his only fixed point.

Shifting the weight of iron in his arms he stepped cautiously across the hot, uneven ground.

They walked about halfway round the worldlet’s circumference. They passed crude shacks scattered in random patterns over the surface; most of the buildings were simple tents of surface material, barely enough to keep out the rain, but others were more substantial, based, Rees saw, on iron frames.

Quid laughed ‘Impressed, miner? We’re coming up in society, aren’t we? See, they all used to shun us. The Raft, the miners, everybody. Much too proud to associate with the likes of the Boneys, after the “crime” we

commit to live . . . But now the stars are going out. Eh, miner? Suddenly they're all struggling to survive; and suddenly they're learning the lessons we learned, all those thousands of shifts ago.' He leaned closer to Rees and winked again. 'It's all trade, you see. For a bit of iron, a few luxuries, we fill the miners' empty food pods. As long as they get a nicely packaged pod they don't have to think too hard about what's in it. Am I right?' And he laughed again, spraying Rees's face with spittle.

Rees shrank away, unable to speak.

A few children emerged from the huts to stare at Rees, their faces dull, their naked bodies squat and filthy. The adults barely registered his passing; they sat in tight circles in their huts, chanting a low, haunting song. Rees could not make out words but the melody was cyclic and compelling.

Quid said, 'So sorry if we seem antisocial. There's a whale in the Coreward sky, see; soon we'll be singing him close.' Quid's eyes grew dreamy and he licked his lips.

Skirting a particularly shabby hut Rees's foot broke through the surface. He found himself ankle-deep in foul, stinking waste. With a cry he backed away and began rubbing his feet against a cleaner section of surface.

Quid roared with laughter.

From within the hut a voice told him, 'Don't worry. You'll get used to it.'

Rees glanced up, startled by the voice's familiarity. Forgetting the filth he stepped closer to the gloom of the hut, peered inside. A man sat alone. He was short and blond, and his frame was gaunt and wrapped in the remnants of a tunic. His face was obscured by a tangle of beard - 'Gord. Is it you?'

The man who had once been the Belt's chief engineer nodded ruefully. 'Hello, Rees. I can't say I expected to see you. I thought you'd stowed away to the Raft.'

Rees glanced around; Quid seemed prepared to wait for him, evidently highly amused. Rees squatted down and briefly outlined his story. Gord nodded sympathetically. His eyes were bloodshot and seemed to loom out of the darkness.

'But what are you doing here?'

Gord shrugged. 'One foundry implosion too many. One death too many. Finally they decided it was all my fault and sent me down here . . . There

are quite a few of us Belters here, you know. At least, quite a few have been brought here . . . Times have worsened since you escaped. A few thousand shifts ago exiling someone down here would have been unthinkable. We barely acknowledged the existence of the place; until we started trading I wasn't even sure the damn Boneys existed.' He reached for a globe of some liquid; he raised it to his lips, suppressing a shudder as he drank.

Rees, watching him, became abruptly aware of his own powerful thirst.

Gord lowered the globe and wiped his lips. 'But I'll tell you, in a way I was glad when they finally found me guilty.' His eyes were red. 'I was so sick of it, you see; the deaths, the stink of burning, the struggle to rebuild walls that couldn't even support themselves—' He dropped his eyes. 'You see, Rees, those of us who are sent here have earned what's happening to us. It's a judgement.'

'I'll never believe that,' Rees murmured.

Gord laughed; it was a ghastly, dry sound. 'Well, you'd better.' He held out his globe. 'Here. Are you thirsty?'

Rees stared at it with longing, imagining the cool trickle of water over his tongue - but then speculations about the origin of the liquid filled him with disgust, and he pushed it away, shaking his head.

Gord, eyes locked on Rees's, took another deep draught. 'Let me give you some advice,' he said softly. 'They're not killers here. They won't harm you. But you have a stark choice. You either accept their ways - eat what they eat, drink what they drink - or you'll finish in the ovens. That's the way it is.

'You see, in some ways it makes sense. Nothing is wasted.' He laughed, then fell silent.

An eerie, discordant song floated into the hut. 'Quid said something about singing to the whales,' Rees said, eyes wide. 'Could that be—'

Gord nodded. 'The legends are true . . . and quite a sight to see. Maybe you'll understand it better than I do. It makes a kind of sense. They need some input of food from outside, don't they? Something to keep this world from devouring itself to skin and bones - although the native life of the Nebula isn't all that nutritious, and there are a few interesting bugs you can catch - I suspect that's the reason the original Boneys weren't allowed to return to the Raft . . .'

'Come on, lad,' Quid called, shifting the load of iron under his arm.

Rees looked at him, then back to Gord. The temptation to stay with Gord, with at least a reminder of the past, was strong . . . Gord dropped his head to his chest, words still dribbling from his mouth. ‘You’d better go,’ he mumbled.

If Rees wanted any hope of escaping this place there was only one choice.

Wordlessly he gripped Gord’s shoulder. The engineer did not look up. Rees got to his feet and walked out of the hut.

Quid’s home was comparatively spacious, constructed around a framework of iron poles. There were no windows, but panels of scraped-thin skin admitted a sickly brown light.

Quid let Rees stay; Rees settled cautiously into one dark corner, his back against the wall. But Quid barely spoke to him and, at length, after a meal of some nameless meat, the Boney threw himself to the floor and settled into a comfortable sleep.

Rees sat for some hours, eyes wide; the eerie keening of the whale-singers washed around him in a tapestry of sound, and he shrank into himself, as if to escape the strangeness of it all. At last fatigue crept over him and he lowered himself to the ground. He rested his face on his folded forearm. The surface was so warm that he had no need for a blanket and he settled into a broken sleep.

Quid, ignoring Rees, came and went on his mysterious errands. He lived alone, but - to judge from the visits he made to his neighbours’ tents bearing packets of iron, and from which he would return adjusting his clothing and wiping his mouth - his iron was buying him out of loneliness.

At first Rees suspected Quid was some kind of leader here, but it soon became apparent that there was little in the way of a formal structure. Some of the Boneys had fairly well-defined roles - for example, Quid was the principal interface with the visitors from the mine. But the hideous ecology seemed largely self-sustaining, and there was little need for organized maintenance. Only the whale hunts, it seemed, brought the population together in any sort of cooperation.

Rees stayed in his corner for perhaps two shifts. Then his thirst became an unbearable pain, and with a cracked voice he asked Quid for drink.

The Boney laughed - but, instead of reaching for one of his stock of drink globes, he beckoned to Rees and left the hut.

Rees climbed stiffly to his feet and followed.

They walked around a quarter of the worldlet's circumference and came to a break in the skin surface. It was a ragged hole perhaps a yard wide, looking disturbingly like a dried-out wound. Splinters of bone obtruded from its lip.

Quid squatted by the hole. 'So you want a drink, miner?' he demanded, his mouth a downturned slash of darkness. 'Well, old Quid's going to show you how you can get as much as you like to eat and drink . . . but the catch is, it's what the rest of us eat and drink. It's either that or starve, laddie; and Quid for one isn't going to mourn the loss of your sneering face from his hut. Right?' And he dropped his feet through the hole and swung himself into the planet's interior.

Fear stirring - but his throat still burning with thirst - Rees approached the hole and peered inside.

The hole was full of bones. A stench like warm meat-sim billowed into his face.

He gagged but held his ground. Shaking his head free of the fumes he sat on the ragged lip of the hole and found purchase for his feet. He stood carefully, holding his breath, and worked his way down into the network of bones.

It was like climbing inside some huge, ancient corpse. The light, filtering through thick layers of skin, was brown and uncertain. The bright eyes of Quid glittered out of the gloom.

And all around Rees there were bones.

He looked around, his breath still trapped inside his body. He was, he realized, standing on a shelf of bones; his back rested against a small mountain of skulls and gaping, toothless jawbones, and his hands gripped a pillar of fused vertebrae. Starlight slanting through the entrance showed him a cross section of skulls, splintered tibiae and fibulae, ribcages like lightless lanterns; here was a forearm still attached to a child's hand. The bones were mostly bare, their colour a weathered-looking brown or yellow; but here and there scraps of skin or hair still clung.

The planet was nothing more than a sparse cage of bones, coated with human skin.

He felt a scream well up from deep within him; he forced it away and expelled his breath in one great sigh, then was forced to draw in the air of

this foul place. It was hot, damp and stank of decaying meat.

Quid grinned at him, his gums glistening. ‘Come on, miner,’ he whispered, the sound muffled. ‘We’ve a little way to go yet.’ And he began to work his way deeper into the interior.

After some minutes Rees followed.

The gravity grew lighter as they descended and a smaller residuum of corpses lay beneath them; at last Rees was pulling himself through the bone framework in virtual weightlessness. Bone fragments, splinters and knuckles and finger joints, battered at his face until it seemed he was passing through a cloud of decay. As they descended the light grew fainter, lost in the intermeshing layers of bones, but Rees’s eyes grew dark-adapted, so that it seemed he could see more and more of the dismal surroundings. The heat, the stench of meat became intolerable. Sweat coated his body, turning his tunic into a sodden mass on his back, and his breath grew shallow and laboured; it seemed almost impossible to extract any oxygen from the grimy air.

He tried to remember that the radius of the worldlet was only some fifteen yards. The journey seemed the longest of his life.

At last they reached the heart of the bone world. In the gloom Rees squinted to make out Quid. The Boney waited for him, hands on hips; he was standing on some dark mass. Quid laughed. ‘Welcome,’ he hissed. He was running his fingers over the forest of bones around him, evidently looking for something.

Rees pushed his feet through a last layer of ribs to the surface on which Quid stood. It was metal, he realized with a shock; battered and coated with grease, but metal nevertheless. He stood cautiously. There was a respectable gravity pull. This had to be some kind of artefact, buried here at the heart of the Boneys’ foul colony.

He dropped to his knees and ran probing fingers across the surface. It was too dark to make out a colour but he could tell that the stuff wasn’t iron. Could it be Ship hull-metal, like the Raft deck in the region of the Officers’ quarters? He closed his eyes and probed at the surface, trying to recall the feel of that faraway deck. Yes, he decided with growing excitement; this had to be an artefact from the Ship.

Pushing his way through the bone framework he paced around the surface. The artefact was a cube some three yards on a side. He stubbed his

toe against an extrusion of metal; it turned out to be the remnant of some kind of fin, reminiscent of the stumps he had observed on the Moles of the mine and the Raft's buses. Could this box once have been fitted with jets and flown through the air?

Speculation welled through his head, pushing aside thirst, revulsion, fear . . . He imagined the original Ship, huge, dark and crippled, opening like a skitter flower and emitting a shoal of sub-ships. There was the Bridge, its surface slick and fast; there were the buses/Moles, perhaps designed to carry one or two crew or to travel unmanned, to land and roll over uncertain surfaces - and then there was this new type, a box capable of carrying - perhaps - a dozen people. He imagined crewmen setting off in this bulky craft, maybe seeking food, or a way to return to Bolder's Ring . . .

But some unknowable accident had hit the box ship. It had been unable to return to the Ship. They had run out of provisions - and to survive, the crew had had to resort to other means.

When at last they had managed to return - or perhaps had been found by a rescue party - they were, in the eyes of their fellows, befouled by their taking of the meat of Nebula creatures - and of their companions.

And so they had been abandoned.

Somehow they had wrestled their wrecked box ship into a stable circular orbit around the Core. And some of them had survived; they had raised children and lived perhaps thousands of shifts before their eyes closed . . . And the children, horrified, had found there was no way of ejecting the corpses; in this billion-gee environment the ship's escape velocity was simply too high.

And generations had passed, until the layers of bones covered the original wreck.

Evidently Quid had found what he was looking for. He tugged at Rees's sleeve, and Rees followed him to the far edge of the craft. Quid knelt and pointed downwards; Rees followed suit and peered over the lip of the craft. In the wall below him there was a break, and just enough light seeped in to let Rees make out the contents of the craft.

At first he could make no sense of it. The ship was jammed with cylindrical bundles of some glistening, red substance; some of the bundles were linked to each other by joints, while others were fixed in rough piles to

the walls by ropes. Some of the material had been baked to a grey-black crisp. There was a stench of decay, of ageing meat.

Rees stared, bemused. Then, in one ‘bundle’, he saw eyesockets.

Quid’s face floated in the gloom, a tormenting mask of wrinkles. ‘We’re not animals, you see, miner,’ he whispered. ‘These are the ovens. Where we bake the sickness out of the meat . . . Usually it’s hot enough down here, what with the decay and all; but sometimes we have to bank fires around the walls . . .’

The bodies were all ages and sizes; flayed and butchered, the ‘bundles’ were limbs, torsos, heads and fingers—

He dragged his head back. Quid was grinning. Rees closed his eyes, forcing down the bile that burned the back of his throat. ‘And there’s no waste,’ Quid whispered with relish. ‘The dried skin is stitched into the surface, so that we walk on the flesh of our ancestors—’

He felt as if the whole, grotesque worldlet were pulsing around him, so that the forest of bones encroached and receded in huge waves. He took deep breaths, letting the air whistle through his nostrils. ‘You brought me down here for drink,’ he said as evenly as he could. ‘Where is it?’

Quid led Rees to a formation of bone. It was a set of vertebrae, almost intact; Rees saw that it was part of a branching series of bones which seemed to reach almost to the surface. Quid touched the spine and his finger came away glistening with moisture. Rees looked more closely and realized that a slow trickle of fluid was working its way down the channel of bones.

Quid pressed his face to the vertebrae, extending a long tongue to lap at the liquid. ‘Runoff from the surface, see,’ he said. ‘By the time it’s diluted by the odd bit of rain and filtered through all those layers up there, it’s fit enough to drink. Almost tasty . . .’ He laughed, and with a grotesque flourish invited Rees to take his turn.

Rees stared at the brackish stuff, feeling life and death choices once more weighing on him. He tried to be analytical. Perhaps the Boney was right; perhaps the crude filtering mechanism above his head would remove much of the worst substances . . . After all, the Boney was healthy enough to tell him about it.

He sighed. If he wanted to survive through more than another shift or two he really had no choice.

He stepped forward, extended his tongue until it almost touched the vertebrae, and allowed the liquid to trickle into his mouth. The taste of it was foul and the stuff was almost impossible to swallow; but swallow it he did, and he reached for another mouthful.

Quid laughed. The Boney's angular hand clamped over the back of his neck and Rees's face was forced into the slim pillar of bone; the edges of it scraped at his flesh and the putrid liquid splashed over his hair, his eyes—

With a cry of disgust Rees lashed out with both fists. He felt them connect with perspiring flesh; with a winded grunt the Boney fell away, landing amid a splintering nest of bones. Wiping his face clear Rees jumped into the network of bones and began to clamber up towards the light, his thrusting feet crushing ribs and skeletal fingers. At last he reached the underside of the surface, but he realized with dismay that he had lost his orientation; the surface of skin spread over him like some huge ceiling, unbroken and lightless. With a strangled scream he shoved his hands into the soft material and tore layers of it aside.

At last he broke through to Nebula air.

He dragged himself from the hole and lay exhausted, staring up at the ruddy starlight.

Rees sought out Gord. The former engineer admitted him without a word, and Rees threw himself to the ground and fell into a deep sleep.

Over the ensuing shifts he stayed with Gord, largely in silence. Rees forced himself to drink - even accompanying Gord on a trip into the interior of the worldlet to fill fresh globes - but he could not eat. Gord gloomily studied him in the darkness of the cabin. 'Don't think about it,' he said. He dropped a fragment of meat into his mouth, chewed the tough stuff and swallowed it. 'See? It's just meat. And it's that or die.'

Rees let a slice of meat lie in the palm of his hand, visualizing the actions of raising it to his lips, biting into it, swallowing it.

He couldn't do it. He threw the fragment into a corner of the hut and turned away. After a while he heard the slow footsteps of Gord as the engineer crossed the room to collect the scrap of food.

So the shifts passed, and Rees felt his strength subsiding. Brushing a hand over the remnants of his uniform he could feel ribs emerging from their mantle of flesh.

The Boneys' singing seemed to pulse like blood.

At length Gord laid a hand on his shoulder. Rees sat up, his head floating. ‘What is it?’

‘The whale,’ Gord said with a hint of excitement. ‘They’re preparing to hunt it. You’ll have to come and see, Rees; even in these circumstances it’s an incredible sight.’

With care Rees stood and followed Gord from the hut.

Peering around groggily he made out the usual groups of adults in their little circles in the huts. They were chanting rhythmically. Even the children seemed spellbound: they sat in attentive groups near the adults, chanting and swaying as best they could.

Gord walked slowly around the worldlet. Rees followed, stumbling; the entire colony seemed to be singing now, so that the skin surface pulsated like a drum.

‘What are they doing?’

‘Calling to the whale. Somehow the song lures the creature closer.’

Rees, befuddled and irritated, said: ‘I don’t see any whale.’

Gord squatted patiently on the floor. ‘Wait a while and you will.’

Rees sat beside Gord and closed his eyes. Slowly the singing worked its way into his consciousness until he was swaying with the cyclic rhythms; a mood of calm acceptance, of welcome even, seemed to spread over him.

Was this what the music was supposed to make the whale feel?

‘Gord, where do you think the word “whale” comes from?’

The engineer shrugged. ‘You were the Scientist. You tell me. Perhaps there was some great creature on Earth with that name.’

Rees scratched the tangle of beard on his jaw. ‘I wonder what an Earth whale looked like—’

Gord’s eyes were widening. ‘Maybe something like that,’ he said, pointing.

The whale rose over the horizon of skin like some huge, translucent sun. The bulk of its body was a sphere perhaps fifty yards wide, dwarfing the bone world; within its clear skin organs clustered like immense machines. The leading face of the whale was studded with three spheres about the size of a man. The way they rotated, fixing on the worldlet and the nearby stars, reminded Rees irresistibly of eyes. Attached to the rear of the body were three huge flukes; these semicircles of flesh were as large as the main sphere and they rotated gently, connected to the body by a tube of dense

flesh. The whale coasted through the air and the flukes soared no more than twenty yards over Rees's head, washing his laughing face with cool air. 'It's fantastic!' he said.

Gord smiled faintly.

The Boneys, still singing, emerged from their huts. Their eyes were fixed on the whale and they carried spears of bone and metal.

Gord leaned close to Rees and said through the song, 'Sometimes they just attach ropes to the creatures, have the whales drag the colony a little way out of the Nebula. Adjusting the orbit, you see; otherwise they might have fallen into the Core long ago. This shift, though, it seems they need meat.'

Rees was puzzled. 'How can you kill a creature like that?'

Gord pointed. 'Not difficult. All you have to do is puncture the skin. It loses its structure, you see. The thing simply crumples into the worldlet's gravity well. Then the trick is to slice the damn thing up fast enough to avoid us all being smothered by flesh . . .'

Now the first spears were flying. The song broke up into shouts of victory. The whale, evidently agitated, began to turn its flukes more quickly. Spears passed clean through the translucent flesh, or embedded themselves in sheets of cartilage - and at last, to a great cry, an organ was hit. The whale lurched towards the surface of the worldlet, its skin crumpling. A mighty ceiling of flesh passed no more than ten feet above Rees's head.

'What about this, miner?' Quid stood beside him, spear in hand. The Boney grinned. 'This is the way to live, eh? Better than scratching in the vitals of some dead star—'

More spears hissed through the air; with increasing precision they looped through the compound gravity field of planet and whale and found soft targets within the body of the whale.

'Quid, how can they be so accurate?'

'It's easy. Imagine the planet as a lump below you. And the whale as another small lump somewhere about there—' He pointed. 'Close to its centre. That's where all the pull comes from, right? So then you just imagine the path you want your spear to follow and - throw!'

Rees scratched his head, wondering what Hollerbach would have made of this distillation of orbital mechanics. But the need for the Boneys -

trapped on their little world - to develop such spear-throwing skills was obvious.

The spears continued to fly until it seemed impossible for the whale to escape. Now its belly was almost brushing the rooftops of the colony. Men and women were producing massive machetes now, and soon the butchery would start. Rees, in his starved, dreamy state, wondered if whale blood would smell different from human—

And suddenly he found himself running, almost without conscious thought. With a light motion he hauled himself to the roof of one of the sturdier huts - could he have moved so cleanly without his recent weight loss? - and stood, staring upwards at the wrinkled, semi-transparent roof of flesh that slid over him. It was still just out of his reach - and then a fold a few feet deep came towards him like a descending curtain. He jumped and grabbed with both hands. His fingers passed through flesh that crumbled, dry. He scrabbled for a firm hold, believing for one, panicky second that he would fall again; and then, his arms elbow-deep in pulpy flesh, his fingers bit into a shank of some tougher material and he pulled himself higher onto the whale's body. He managed to swing his feet up and embed them in the fleshy ceiling; and so, upside down, he sailed over the Boney colony.

His boarding seemed to galvanize the whale. Its flukes beat the air with renewed vigour and it rose from the surface with wrenches that threatened to tear Rees from his precarious hold.

Angry voices were raised at him, and a spear whistled past his ear and into the soft flesh. Quid and the other Boneys waved furious fists. He saw the pale, upturned face of Gord streaming with tears.

The whale continued to rise and the colony turned from a landscape into a small, brown ball, lost in the sky. The human voices faded to the level of the wind. The warm skin of the whale pulsed with its steady motion; and Rees was alone.

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10

Its tormentors far behind, the great beast moved cautiously through the air; the flukes turned with slow strength, and the vast body shuddered. It was as if it were exploring the dull pain of the punctures it had suffered. Through the translucent walls of the body Rees could see triple eyes turn fully backwards, as if the whale were inspecting its own interior.

Then, with a sound like the wind, the flukes' speed of rotation increased. The whale surged forward. Soon it had climbed clear of the bone world's gravity well, and Rees's sensation of clinging to a ceiling was transformed into a sense of being pinned against a soft wall.

With some curiosity he examined the substance before his face. His fingers were still locked in the layer of cartilage beneath the whale's six-inch layer of flesh. The flesh itself had no epidermis and was vaguely pink in colour; the stuff had little more consistency than a thick foam and there was no sign of blood, although Rees noticed that his arms and legs had become coated with some sticky substance. He recalled that the Boneys hunted this creature for food, and on impulse he pushed his face into the flesh and tore away a mouthful. The stuff seemed to melt in his mouth, compacting from a fluffy bulk to a small, tough lozenge. The taste was strong and slightly bitter; he chewed and swallowed easily. The stuff even seemed to soothe the dryness of his throat.

Suddenly he was starving, and he buried his face in the whale flesh, tearing chunks away with his teeth.

After some minutes he had cleared perhaps a square foot of the soft flesh, exposing cartilage, and his stomach felt filled. So, then, he could expect the whale to provide for him for some considerable time.

He looked around. Clouds and stars stretched all around him, a vast, sterile array without walls or floor. He was, of course, utterly adrift in the red sky, and surely now beyond hope of seeing another human face again. The thought did not frighten him; rather, he became gently wistful. At least he had escaped the degradation of the Boneys. If he had to die, then let it be like this, with his eyes open to new wonders.

He shifted his position comfortably against the bulk of the whale. It took very little effort to stay in place, and the steady motion, the pumping of

the flukes were surprisingly soothing. It might be possible to survive quite some time here, before he weakened and fell away . . .

His arms were beginning to ache. Carefully, one hand at a time, he shifted the position of his fingers; but soon the pain was spreading to his back and shoulders.

Could he be tiring so quickly? The effort to cling on here, in these weightless conditions, was minimal. Wasn't it?

He looked back over his shoulder.

The world was wheeling around him. The stars and clouds executed vast rotations around the whale; once again he was clinging to a ceiling from which he might fall at any moment . . .

He almost lost his grip. He closed his eyes and dug his fingers tighter into the sheet of cartilage. He should have anticipated this, of course. The whale had rotational symmetry; of course it would spin. It would have to compensate for the turning of its flukes, and spinning would give it stability as it forged through the air. It all made perfect sense . . .

Wind whipped over Rees's face, pushing back his hair. The rate of spin was increasing; he felt the strain on his fingers mount. If he didn't stop analysing the damn situation and do something, before many more minutes passed he would be thrown off.

Now his feet lost their tenuous hold. His body swung away from the whale's, so that he was dangling from his hands. The cartilage in his clamped fingers twisted like elastic, and with each swing of his torso pain coursed through his biceps and elbows. The centrifugal force continued to rise, through one, one and a half, two gee . . .

Perhaps he could head for one of the stationary 'poles', maybe at the joint between the flukes and the main body. He looked sideways towards the rear of the body; he could see the linking tube of cartilage as a misty blur through the walls of flesh.

It might have been a world away. It was all he could do to cling on here.

The spin increased further. Stars streaked below him and he began to grow groggy; he imagined blood pooling somewhere near his feet, starving his brain. He could hardly feel his arms now, but when he stared up through black-speckled vision he could see that the fingers of his left hand, the weaker, were loosening.

With a cry of panic he forced fresh strength into his hands. His fingers tightened as if in a spasm.

And the cartilage ripped.

It was like a curtain parting along a seam. From the interior of the whale a hot, foul gas billowed out over him, causing him to gasp, his eyes to stream. The ruptured cartilage began to sag. Soon a great fold of it was suspended beneath the belly of the whale; Rees clung on, still swinging painfully.

Now a ripple a foot high came rolling down the whale's belly wall. The whale's nervous system must be slow to react, but surely it could feel the agony of this massive hernia. The wave reached the site of the rupture. The dangling fold of cartilage jerked up and down, once, twice, again; Rees's shoulders felt as if they were being dragged from their sockets and needles thrust into the joints.

Again his fingers loosened.

The rip in the sheet was like a narrow door above him.

Shoulders shaking, Rees hauled himself up until his chin was level with his fists. He released his left hand—

—and almost fell altogether; but his right hand still clutched at the cartilage, and now his left hand was locked over the lip of the wound. He released his right hand; the weaker, numb left slipped over greasy cartilage but - now - he had both hands clamped at the edge of the aperture.

He rested there for a few seconds, the muscles of his arms screaming, his fingers slipping.

Now he worked the muscles of his back and dragged his feet up before his face, shoved them over his head and through the aperture. Then his legs and back slid easily over the inner surface of the cartilage and into the body of the whale, and finally he was able to uncurl his fingers. With the last of his strength he rolled away from the aperture.

Breathing hard he lay on his back, spread-eagled against the whale's inner stomach wall. Below him, obscured by the translucent flesh, were the wheeling stars, and far above, like huge machines in some vast, dimly lit hall, were the organs of the whale.

His lungs rattled; his arms and hands were on fire. Blackness fell over him and the pain dropped away.

He awoke to a raging thirst.

He stared up into the cavernous interior of the whale. The light seemed dimmer: perhaps the whale, for reasons of its own, was flying deeper into the Nebula.

The air was hot, damp, and foul with a stench like sweat; but, though his chest ached slightly, he seemed to be breathing normally. Cautiously he propped himself up on his elbows. The muscles of his arms felt ripped and the fingernails on both hands were torn; but the bones of his fingers seemed intact and in place.

He climbed cautiously to his feet.

Stars still wheeled around the whale, but if he averted his eyes he felt no dizziness. It was as if he were standing in a steady gravity well of about two gees. Looking down he saw that his bare feet had sunk a couple of inches into the resilient cartilage. With some experimentation he found he could walk with little difficulty, provided he avoided slipping on the slick surface.

Again thirst tore at his throat; it felt as if the back of his mouth were closing up with the dryness.

He made his way to the aperture he had torn in the cartilage sheet. The wound had already closed to a narrow slit barely as wide as his waist. He had no way of telling how long he had been unconscious, but surely it must have taken a shift at least for the healing to progress this far. He knelt down, the cartilage beneath his knees a warm, wet carpet, and pushed his face close to the wound. A breeze bore him welcome fresh air. He could see the dangling flap of cartilage up which he had scrambled to safety: the ripped skin had grown opaque and was covered in a mass of fine creases. Perhaps eventually the dangling fold would be isolated outside the body, atrophy and fall away.

Thanks to Rees’s scrambling the area of cartilage around the wound was scraped clear of flesh; only a few clumps clung here and there, like isolated patches of foliage on an old tree. Rees lay on the warm floor, took a fold of cartilage in his left hand, and thrust his head and right arm out through the wound. He swept his arm around the outer wall of the whale’s belly, hauling in as much flesh matter as he could reach. As he worked, the breeze of the whale’s rotation washed steadily over his face and bare arms.

When he was done he withdrew from the wound and hauled away his meagre supply. He shoved a fistful into his mouth immediately. Sticky whale juice trickled, soothing, down his parched throat and fluffy flesh

clung to his straggling beard; he squatted on the warm floor, and, for a few minutes, ate steadily, postponing thoughts of an impossible future.

When he was done, his thirst and hunger at least partially sated, his pile of flesh was reduced by at least half. The damn stuff would last hardly any time at all . . . He crammed the rest into the pockets of his filthy coverall.

Now he became aware of another problem, as the pressure in his bladder and lower bowels began to grow painful. He felt oddly reluctant to relieve himself inside the body of another creature; it seemed an obscene violation. But, the muscles of his lower stomach told him, he didn't really have a lot of choice. At last he loosened his trousers and squatted over the narrowest section of the rent in the stomach wall.

He had a bizarre image of his waste being flung through the air in a cloud of brown and yellow. It was highly unlikely, of course, but perhaps one day the stuff would reach the Belt, or the Raft; would one of his acquaintances look up in horror for the source of this foul rain - and think of him?

He laughed out loud; the sound was absorbed by the soft wall around him. He could think of a few nominations for the recipient of such a message. Gover, Roch, Quid . . . Maybe he should take aim.

His needs satisfied, his curiosity began to reassert itself, and he stared around at the mysterious interior of the whale. It was like being inside some great, glass-walled ship. From the leading face a wide tube stretched down the axis of the body, contracting as it neared the rear. Entrails of some kind branched off, looking like fat, pale worms that coiled around the principal oesophagus. Sacs which could hold four men were suspended around the axial tube, filled with obscure, unmoving forms. Organs were clustered around the main axial canal; and others, vast and anonymous, were fixed to the inner wall of the skin.

Beyond the body's rear Rees could make out the joint to the fluke section, and then the great semicircular flukes themselves, washing through the air with immense assurance and power. The motion of the flukes and the wheeling shadows cast by the starlight through the translucent skin gave the place a superficial impression of motion; but otherwise, apart from a subdued humming, the vast space was still and calm. Rees had read of the great cathedrals of Earth; he remembered staring at the old pictures and

wondering what it would be like to stand inside such ancient, huge, still spaces.

Perhaps it would be something like this.

Stepping cautiously over the slippery, yielding surface, he began to make his way towards the whale's leading face.

He neared an organ fixed to the floor. It was an opaque, flattened sphere, twice as tall as he was, and its mass tugged gently at him He pressed his palm to the tough, lumpy flesh; beneath the surface he could feel hot liquid churn. Perhaps this was the equivalent of a liver or kidney. Crouching, he could see how the organ was attached to the stomach wall by a tight, wrinkled ring of flesh; the ring was clear enough for him to see liquid pulse to and from the dense cartilage.

A Boney spear protruded from the organ, its tip buried an arm's length inside the soft material. Rees took the shaft and carefully slid the spear away from the organ; it emerged damp and sticky. He propped the spear safely within a fold of flesh and walked on.

The floor slanted sharply upwards as he began to climb the slope of the body towards the axis of rotation. At last he was climbing a near-vertical, sheer surface, and he was forced to dig his hands into the cartilage. As he climbed towards the axis the centripetal force lessened, although a Coriolis effect began to make him stagger.

He paused for breath and looked back over the slope he had climbed. The organs fixed to the apparent floor and walls of the chamber were like mysterious engines. The tube of the oesophagus stretched away above his head; he noticed now that wrapped around it, close behind the eyes, was a large, spongy mass; filaments like rope connected the sponge to the eyes - optic nerves? Perhaps the convoluted lump was the whale's brain; if so its mass relative to its body must compare favourably with a human's.

Could the whale be intelligent? That seemed absurd . . . but then he remembered the song of the Boney hunters. The whale must have a reasonably sophisticated sensorium to be able to respond to such a lure.

At last he reached a position just below the join of the oesophagus to the face. The whale's triple eyes hung over him like vast lamps, staring calmly ahead; it felt as if he were clinging to the inside of some huge mask.

The face rippled, almost casting him free; he clung tighter to the cartilage. Staring up he saw that the centre of the face had split, becoming

an open mouth which led directly into the huge throat.

Rees looked out through the face. He made out a blur of motion which slowly resolved itself into a shoal of ghost-white plates which whirled in the air before the whale. These plate creatures were no more than three or four feet wide; some of them, perhaps the young, were far smaller. The creatures had upturned rims - no doubt for aerodynamic reasons - and Rees saw how purplish veins crisscrossed the upper surface of the discs.

The creatures scattered in alarm as the whale approached. The whale's three eyes locked on the plate animals, triangulating with hungry precision. Soon the plates were impacting the great, flat face; the cartilage resounded like a drum-skin, making Rees flinch. Doomed plate creatures, still spinning feebly, slid into the whale's maw and disappeared into the opaque oesophagus, and soon a series of bulges were passing down the great tube. Rees imagined the still living plates hurling themselves against the walls that had closed around them after a lifetime of free air. After some minutes the first bulge reached a branch to the semi-transparent entrails. Battered plates emerged into the comparative stillness of the intestines, some still turning feebly. With vast pulses of clear muscle the bodies were worked along the entrails, dissolving as they moved through vats of digestive gases or fluids.

For perhaps thirty minutes the whale cut a path through the cloud of plate creatures . . . and then something fast moved at the rim of Rees's peripheral vision. He twisted, peering.

There was a blur, something red and dense that shot across the sky. Now another, and a third; and now a whole flock of them, raining through the air like missiles. The things descended on the shoal of plate creatures in a great, frenzied blur of motion and blood; when they moved on they left behind a cloud of blood and meat scraps—

—and one of the blurs flew at Rees's face. He cried out and flinched backwards, almost losing his grip on the cartilage mask; then he steadied himself and stared back at the creature.

It had come to a halt mere yards before him. It was little more than a flying mouth. A red stump of a body, limbless, perhaps two yards long, was fronted by a circular maw wider than Rees could reach. Eyes like beads clustered round the mouth, which was ringed by long teeth, needle points

turned inwards. Now the mouth closed, the flesh stretching over a rudimentary bone structure, until teeth met in a grind of white flashes.

Rees could almost imagine this sky wolf licking its lips as it studied him.

But the eyes of the whale fixed the wolf with a haughty glare, and after a few seconds the wolf shot away to join its companions amid the easier meat of the plate creatures.

Apparently satiated, the whale surged out of the cloud of plates and into clear air. Looking back, Rees could see the sky wolves continue to feast on the hapless plates.

The sky wolves were creatures of children's tales; Rees had never encountered one before. No doubt, like uncounted other species of Nebula flora and fauna, the plates and wolves were careful to avoid the homes of man. Was he the first human to see such a sight? And would the Nebula die before mankind could explore the marvels this strange universe had to offer?

A heavy depression fell upon Rees, and he pressed his face against the inner face of the whale.

The whale forged ever deeper into the heart of the Nebula; the air outside grew darker.

Rees woke from a dream of falling.

His back was pressed against the inner face of the whale, his hands locked around folds of cartilage; cautiously he uncurled his fingers and worked the stiff joints.

What had woken him? He scanned the cavernous interior of the whale. Shafts of starlight still swept through the body like torch beams—

—but, surely, more slowly than before. Was the whale coming to rest?

He turned to look out of the whale's face . . . and felt a tingle of wonder at the base of his skull. Peering in at him, not a dozen yards from where he stood, were the three eyes of a second whale. Its face was pressed to that of 'his' whale, and he saw how the mouths of the two vast creatures worked in sympathetic patterns, almost as if they were speaking to each other.

Now the other whale peeled away, its flukes beating, and the view ahead cleared. Again, wonder surged through Rees, causing him to gasp. Beyond the second whale was another, side on, forging through the air - and beyond that another, and another; as far as Rees's eyes could see, above him and

below him, there was a great array of whales which swam through the Nebula. The school must have been spread through cubic miles: the more distant of them were like tiny lanterns illuminated by starlight.

Like a great, pinkish river, the whales were all streaming towards the Core.

From behind Rees there was a low grind, as if some great machine were stirring. Turning, he saw that the joint connecting the main body of the whale to its fluke section was swivelling; bones and muscles the size of men hauled at the mass of turning flesh. Soon the whale was banking around a wide arc, its flukes beating purposefully. The whale's rotation increased once more, turning the school of whales into a kaleidoscope of whirling flukes; and at last the whale settled into a place in the vast migration.

For hours the school forged on into increasing darkness. The stars at these depths were older, dimmer, their proximity increasing as the Core neared. Rees made out two stars so close they almost touched: their tired fires were drawn out in great mounds, and they whirled around each other in a pirouette seconds long. Later the whales passed a massive star, miles across; its fusion processes seemed exhausted, but the iron of its surface, compressed by gravity, gave off a dull, sombre glow. The surface was a place of constant motion: every few minutes a portion would subside, leaving a crater perhaps yards wide and a spray of molten particles struggling a few feet into the air. Smaller stars circled the giant in orbits of several minutes, and Rees was reminded of Hollerbach's orrery: here was another 'solar system' model, made not of metal beads but of stars . . .

The school reached another collection of stars bound by gravity; but this time there was no central giant: instead a dozen small stars, some still burning, whirled through a complex, chaotic dance. At one moment it seemed two stars must collide . . . but no; they passed no more than yards apart, spun around and hurtled off in new directions. The motion of the star family showed no structure, no periodicity - and Rees, who in his time on the Raft had studied the chaotic aspects of the three-body problem, was not surprised.

Still the gloom deepened. A gathering blackness ahead told Rees they were nearing the Core. He remembered the Telescopic journey into the Nebula he had taken at the time of the revolt with that young Class Three -

what was his name? Nead? Little had he dreamt that one day he would repeat the journey in person, and in such a fantastic fashion . . .

Again he thought briefly of Hollerbach. What would that old man give to be seeing these wonders? A mood of contentment, perhaps brought on by his memories, settled over Rees.

Now, as on his Telescopic journey, the mists of the Nebula's heart lifted away like veils from a face, and he began to make out the sphere of debris around the Core itself. Through breaks in the shell of rubble a pink light flickered.

Slowly Rees began to realize he was staring at his own death. What would get him first? The hard radiation sleeting from the black hole? Perhaps the tidal effects of the Core's gravitation would tear his head and limbs from his body . . . or, as the softer structure of the whale disintegrated, maybe he would find himself tumbling helpless in the air, baked or asphyxiated in the oxygen-starved atmosphere.

But still the odd mood of contentment lingered, and now he felt a slow, soothing music sound within his head. He let his muscles relax and he settled comfortably against the inner face of the whale. If this really were to be his death - well, at least it had been an interesting journey.

And perhaps, after all, death wouldn't be the final end. He recalled some of the simple religious beliefs of the Belt. What if the soul survived the body, somehow? What if his journey were to continue on some other plane? He was struck by a vision of a stream of disembodied souls streaking out into space, their flukes slowly beating—

Flukes? What the hell—?

He shook his head, trying to clear it of the bizarre images and sounds. Damn it, he knew himself well enough to know that he shouldn't be facing death with an elegiac smile and a vision of the afterlife. He should be fighting, looking for a way out . . .

But if these thoughts weren't his own, whose were they?

With a shudder he turned and stared at the bulge of brain around the whale's oesophagus. Could the beast be semi-telepathic? Were the images seeping into his head from that great mound, mere yards from him?

He remembered how the chanting of the Boney hunters had attracted the whales. Perhaps the chanting set up some sort of telepathic lure which baffled and attracted the whales. With a start he realized that the steady

music in his head had the same structure, the same compelling rhythm and cyclical melodies, as the Boneys' song. It must be coming from outside him - though whether through his ears or by telepathic means he found it impossible to distinguish. So the Boneys, perhaps by chance, had found a way to make the whales believe they were swimming, not towards a slow death at the hands of tiny, malevolent humans, but towards—

What? Where did these whales, swimming to the Core, think they were going, and why were they so happy to be going there?

There was only one way to find out. He quailed at the thought of opening his mind to further violation; but he fixed his hands tightly around the cartilage, closed his eyes, and tried to welcome the bizarre images.

Again the whales streaked into the air. He tried to observe the scene as if it were a photograph before him. Were these things really whales? Yes; but somehow their bulk had been reduced drastically, so that they became pencil-shaped missiles soaring against minimal air resistance to . . . where? He struggled, compressing his eyes with the back of one hand, but it wouldn't come. Well, wherever it was, 'his' whale felt nothing but delight at the prospect.

If he couldn't see the destination, what about the source? Deliberately he lowered his head. The image in his mind panned down, as if he were tracking a Telescope across the sky.

And he saw the source of the whales' flight. It was the Core.

He opened gritty eyes. So the creatures were not plunging to their deaths; somehow they were going to use the Core to gain enormous velocities, enough to send them hurtling out—

—out, he realized with a sudden burst of insight, of the Nebula itself.

The whales knew the Nebula was dying. And, in this fantastic fashion, they were migrating; they would abandon the fading ruin of the Nebula and cross space to a new home. Perhaps they had done this dozens, hundreds of times before; perhaps they had spread among the nebulae in this way for hundreds of thousands of shifts . . .

And what the whales could do, surely man could emulate. A great wave of hope crashed over Rees; he felt the blood burn in his cheeks.

The Core was very near now; shafts of hellish light glared through the shell of debris, illuminating the rubble. Ahead of him he could see whales

expelling air through their mouths in great moist plumes; their bodies contracted like slowly collapsing balloons.

The rotation of Rees's whale slowed. Soon it would enter the deepening throat of the Core's gravity well . . . and surely Rees would die. As rapidly as it had grown his bubble of hope disintegrated, wiping away the last traces of his false contentment. He had perhaps minutes to live, and locked in his doomed head was the secret of the survival of his race.

A howl of despair broke from his throat, and his hands clenched convulsively around the cartilage of the face.

The whale shuddered.

Rees stared unbelieving at his hands. Up to now the whale had shown no more awareness of his presence than would he of an individual microbial parasite. But if his physical actions had not disturbed the whale, perhaps his flood of despair had impacted on that vast, slow brain a few yards away . . .

And perhaps there was a way out of this.

He closed his eyes and conjured up faces. Hollerbach, Jaen, Sheen, Pallis tending his forest; he let the agony of their anticipated deaths, his longing to return to and to save his people flood through him and focus into a single, hard point of pain. He physically hauled at the whale's face, as if by brute force he could drag the great creature from its path into the Core.

A monstrous sadness assailed Rees now, a pleading that this human infection should leave the whale be to follow its herd to safety. Rees felt as if he were drowning in sorrow. He fixed on a single image: the wonder on the face of the young Third, Nead, as he had watched the beauty of the Nebula's rim unfold in the Telescope monitor; and the whale shuddered again, more violently.

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11

The assault of the mine craft on the Raft had been underway for only thirty minutes, but already the air around the Platform was filled with the cries of wounded.

Pallis crawled through the foliage of his tree, working feverishly at the fire bowls. A glance through the leaves showed him that his blanket of smoke was even and thick. The tree rose smoothly; he felt a warming professional satisfaction - despite the situation.

He raised his head. The dozen trees of his flight were arrayed in a wide, leafy curve which matched the arc of the Raft a hundred yards above: they were just below the Platform, according to his charts of the underside. His trees rose as steadily as if attached by rods of iron; in a few minutes they would sweep over the Raft's horizon.

He could see the nearer pilots as they worked at their fires, their thin faces grim.

'Can't we speed it up?' Nead stood before him, his face stretched with anxiety and tension.

'Keep at your work, lad.'

'But can't you hear them?' The young man, blinking away tears, shook a fist towards the thin battle noise drifting down from the Platform.

'Of course I can.' Pallis willed the temper to subside from his scarred mask of a face. 'But if we go off half-cocked we'll get ourselves killed. Right? On the other hand, if we stick to our formation, our plan, we've a chance of beating the buggers. Think about it, Nead; you used to be a Scientist, didn't you?'

Nead wiped his eyes and nose with the palm of his hand. 'Only Third Class.' 'Nevertheless, you've been trained to use your brain. So come on, man; there's a job of work to be done here and I'm relying on you to do it. Now then, I think those bowls near the trunk need restocking . . .'

Nead returned to work; for a few moments Pallis watched him. Nead's frame was gaunt, his shoulder blades and elbows prominent; his Scientist's coverall had been patched so many times it was barely recognizable as a piece of cloth, let alone a uniform. When his eyes caught Pallis's they were black-ringed.

Nead was barely seventeen thousand shifts old. By the Bones, Pallis thought grimly, what are we doing to our young people?

If only he could believe in his own damn pep talks he might feel better.

The flight swept out of the shadow of the Raft, and leaves blazed golden-brown in the sudden starlight. Pallis could feel the tree's sap churn through its branches; its rotation increased like an eager skitter's and it seemed to leap up at the star which hung in the Raft's sky.

The Rim was mere yards above him now. He felt a growl building in his throat, dark and primeval. He raised a fist above his head; the other pilots waved their arms in silent salute.

. . . And the line of trees soared over the Platform.

A panorama of blood and flames unfolded before Pallis. People ran everywhere. The deck was crowded with blazing awnings and shelters; where the roofs had been blasted away Pallis could see papers burning in great heaps. The sudden downwash from the trees' branches caused the fires to flicker and belch smoke.

Three mine craft - iron plates fitted with jets - hovered a dozen yards above the Platform. Their jets spat live steam; Pallis saw Raft men squirm, the flesh blistering away from incautious limbs. Miners, two or three to a craft, lay belly down on the plates, dropping bottles which bloomed fire like obscene flowers.

This was the worst assault yet. Previously the miners had targeted the sites of the supply machines - their main objective - and had largely been beaten off, with low casualties on either side. But this time they were striking at the heart of the Raft's government.

There was little sign of organized defence. Even Pallis's flight had been near the end of its patrol of the underside when the miners attacked; if not for a pilot's sharp eyes the Raft might have been unable to mount any real counterthrust. But at least the Platform's occupants were fighting back. Spears and knives lanced up at the hovering plate craft, forcing the miners to cower behind their flying shields—

—until, as Pallis watched, one spear looped over a craft and made a lucky strike, driving through a miner's shoulder. The man stared at the bloody tip protruding from his muscle, grabbed it with his good hand, and began to scream.

The craft, undirected, tipped.

The other occupants of the craft called out and tried to reach the controls; but within seconds the plate, swaying, had fallen to within a few feet of the deck. Raft men braved live steam to force their way to the craft; a hundred hands grabbed its rim and the steam jets sputtered and died. The miners were hauled, screaming, from the plate, and were submerged by the flailing arms of the Raft men.

Now the tree flight was perhaps a dozen yards above the Rim and was noticed for the first time by the combatants. A ragged cheer spread through the chaotic ranks of the defenders; the miners turned their heads and their faces went slack. Pallis felt a crude pride as he imagined how this awesome dawn of wood and leaves must look to the simple Belt folk.

Pallis turned to Nead. ‘Almost time,’ he murmured. ‘Are you ready?’

Nead stood by the trunk of the tree. He held a bottle of fuel; now he lit the wick with a crude match and held the burning lint before his face. His eyes were deep with hatred. ‘Oh, I’m ready,’ he said.

Shame surged through Pallis.

He turned to the battle. ‘All right, lad,’ he said briskly. ‘On my count. Remember, if you can’t hit a miner douse your flame; we’re not here to bomb our own people.’ The tree swept over the mêlée; he saw faces turn up to his shadow like scorched skitter flowers. The nearest plate ship was mere yards away. ‘Three . . . two . . .’

‘Pallis!’

Pallis turned sharply. One of the other pilots stood balancing on the trunk of his tree, his hands cupped to his mouth. He turned and pointed skywards. Two more mine craft flew above him, their ragged edges silhouetted against the sky. Squinting, Pallis could make out miners grinning down at him, the glint of glass in their hands; the miners were obviously trying to get above his trees.

‘Shit.’

‘What do we do, Pallis?’

‘We’ve underestimated them. They’ve caught us out, ambushed us. Damn it. Come on, lad, don’t just stand there. We’ve got to rise before they get above us. You work on the bowls near the rim, and I’ll get to the trunk.’

Nead stared at the encroaching forms of the miners as if unable to accept this distraction from the simple verities of the battle below.

‘Move!’ Pallis snapped, thumping his shoulder.

Nead moved.

A floor of smoke spread beneath the trees, spilling over the battlefield. The great wheels lurched up and away from the deck . . . but the mine craft were smaller, faster and far more manoeuvreable. Effortlessly they moved into position above the flight.

Pallis felt his shoulders sag. He imagined a fire bomb hitting the dry branches of his tree. The foliage would burn like old paper; the structure would disintegrate and send blazing fragments raining over the deck—

Well, he wasn't dead yet. 'Scatter!' he yelled to his pilots. 'They can't take us all.'

The formation broke with what seemed ponderous slowness. The two mine craft split up, each making for a tree . . .

And one of them was Pallis's.

As the plate descended the tree-pilot's eyes met those of the miner above him. Nead came to stand close by the pilot. Pallis reached out, found Nead's shoulder, squeezed hard—

Then a cold breeze shook the tree and a shadow swept across his face, shocking and unexpected. A huge form sailed across the face of the star above the Raft.

'A whale . . .' Pallis felt his jaw drop. The great beast was no more than a hundred yards above the deck of the Raft; never in his life had he known a whale to come so close.

When the miners attacking Pallis saw the vast translucent ceiling mere yards above them they called out in panic and jerked at their controls. The plate wobbled, spun about, then shot away.

Bewildered, Pallis turned to survey the Platform battle. The whale's cloudy shadow swept across tiny, struggling humans. Men dropped their weapons and fled. The remaining miners' craft squirted into the air and sailed over the lip of the Raft.

Save for the dead and wounded, the Platform was soon deserted. Fires flickered desultorily from a dozen piles of wreckage.

Nead was sobbing. 'It's over, isn't it?'

'The invasion? Yes, lad; it's over. For now, at any rate . . . Thanks to that miracle.' He stared up at the whale, imagining the confusion it must be causing as people looked up from the Raft's avenues and factories at this

monster in the sky. ‘But the miners will be back. Or maybe,’ he added grimly, ‘we’ll be forced to go to meet them . . .’

His voice tailed away.

Clinging to the belly of the whale, waving feebly, was a man.

At the outbreak of the miners’ attack Gover had joined the mob crowding down the stairway from the Platform, using his fists and elbows to escape the flying glass, the screams, the fire. Now, as suddenly as it had begun, the attack was over. Gover crawled from his shelter under the Platform and climbed cautiously back up the stairs.

Fearfully he scanned the burning shelters, the blackened bodies - until he saw Decker. The big man was stalking through the devastation, bending to assist medical efforts, throwing a kick at the scorched ruin of a bookcase. His motions had the look of a man caged by frustration and anger.

But he was obviously far too busy to have observed that Gover had made himself scarce during the battle. With relief Gover hurried towards Decker, eager to be noticed now; his footsteps crunched over shattered glass.

A shadow swept across the littered deck. Gover quailed, twisted his head and looked up.

A whale! And no more than a hundred yards above the Raft, drifting like a vast, translucent balloon. What the hell was going on? His agile mind bubbled with speculation. He’d heard tales that the whales could be trapped and hunted. Maybe he could have Decker send up some of those damn fool tree-pilots; he had a gratifying vision of standing at the rim of a tree, hurling his fire bombs into a huge, staring eye—

Someone thumped his arm. ‘Get out of the way, damn you.’

Two men were trying to get past him. They half dragged a woman; her face was ruined by flame, and tears leaked steadily from her remaining eye. Gover, annoyed, prepared to snap at the men - these weren’t even Committee members . . . but something about the tired tension in their faces made him step aside.

He glanced up once more, noticing without interest that a tree was rising towards the whale . . . then he made out a dark, irregular blot on the whale’s hide. He squinted against the almost direct starlight.

By the Bones, it was a man. A coarse wonder blossomed in Gover, and for a brief moment his self-centredness evaporated. How the hell could a

man end up riding a whale?

The whale rolled slowly, bringing the man a little closer. There was something naggingly familiar about the whale rider's dimly seen frame—

Gover had no idea what was going on; but maybe he could make something out of this.

His breath hissing through his teeth, Gover worked his way through the wounded and battle-weary, searching for Decker.

In the hours after he had 'persuaded' the whale to leave its school, Rees had often wished he could die.

The whale climbed steadily out of the Nebula's depths, convulsed with loneliness and regret at leaving its companions. It drowned Rees in a huge pain, burnt him with the fierce, enormous agony of it all. He had been unable to eat, sleep; he had lain against the stomach wall, barely able to move, even his breathing constricted; at times, barely conscious, he had found himself squirming across the belly floor's warm slime.

But he kept his concentration. Like match flames in a wind he held before his mind's eye images of Hollerbach, Pallis and the rest; and with the Raft fixed in his thoughts, he crooned the whales' song, over and over.

Shifts had passed as Rees lay there, dreading sleep. Then, quite abruptly, he sensed a change; a breeze of confusion had been added to the whale's mental storm, and the beast seemed to be sweeping through tight curves in the air. He rolled onto his belly and peered through the murky cartilage.

At first he could not recognize what he saw. A vast, rust-brown disc which dwarfed even the whale, a sparse forest of trees turning slowly over unlit avenues of metal . . .

It was the Raft.

With sudden strength he had torn at the cartilage before his face, forcing his fingers through the dense, fibrous material.

The tree rose steadily towards the rolling bulk of the whale.

'Come on, boy,' Pallis snapped. 'Whoever's up there saved our skins. And now we're going to save him.'

Reluctantly Nead worked at his fire bowls. 'Surely you don't think he brought the whale here intentionally?'

Pallis shrugged. 'What other explanation is there? How many times have you seen a whale come so close to the Raft? Never, that's how many.

And how often do you see a man riding a whale?

‘Two impossible events in one shift? Nead, the law of the simplest hypothesis tells you that it’s all got to be connected.’ Nead glanced at him curiously. ‘You see,’ Pallis grinned, ‘even Scientists Third Class don’t have the monopoly on knowledge. Now work those bloody bowls!’

The tree rose from its blanket of smoke. Soon the whale filled the sky; it was a monstrous, rolling ceiling, with the passenger carried around and around like a child on a roundabout.

As the tree closed, its rotation slowed jerkily, despite all Nead’s efforts. At last it came to rest altogether perhaps twenty yards beneath the belly of the whale.

The whale’s three eyes rolled downwards towards the succulent foliage.

‘There’s nothing I can do,’ Nead called. ‘The damn smoke’s thick enough to walk on, but she just won’t budge.’

‘Nead, a tree has about the same affection for a whale as a plate of meat-sim has for you. She’s doing her best; just hold her steady.’ He cupped his hands and bellowed across the air. ‘Hey, you! On the whale!’

He was answered by a tentative wave.

‘Listen, we can’t get any closer. You’ll have to jump! Do you understand?’

A long pause, then another wave.

‘I’ll try to help you,’ Pallis called. ‘The whale’s spin should throw you across; all you have to do is let go at the right time.’

The man buried his face in the flesh of the whale, as if utterly weary. ‘Nead, the guy doesn’t look too healthy,’ Pallis murmured. ‘When he comes this way he might not do a good job of grabbing hold. Forget the fire bowls for a minute, and stand ready to run where he hits.’

Nead nodded and straightened up, toes locked in the foliage.

‘You up there . . . we’ll do this on the next turn. All right?’

Another wave.

Pallis visualized the man parting from the whale. He would leave the spinning body tangentially, travel in a more or less straight line to the tree. There should really be no problem - provided the whale didn’t take it into its head to fly off at the last second—

‘Now! Let go!’

The man raised his head - and, with agonizing slowness, curved his legs beneath him.

‘That’s too slow!’ Pallis cried. ‘Hold on or you’ll . . .’

The man kicked away, sailing along a path that was anything but tangential to the whale’s spin.

‘ . . . Or you’ll miss us,’ Pallis whispered.

‘By the Bones, Pallis, it’s going to be close.’

‘Shut up and stand ready.’

The seconds passed infinitely slowly. The man seemed limp, his limbs dangling like lengths of rope. Thanks to the man’s release the whale’s spin had thrown him to Pallis’s right - but, on the other hand, his kick had taken him to the left—

—and the two effects together were bringing him down Pallis’s throat; suddenly the man became an explosion of arms and legs that plummeted out of the sky. The man’s bulk crumpled against Pallis’s chest, knocking him backwards into the foliage.

The whale, with a huge, relieved shudder, soared into the sky.

Nead lifted the man off Pallis and laid him on his back. Under a tangle of filthy beard the man’s skin was stretched tight over his cheek bones. His eyes were closed, and the battered remnants of a coverall clung to his frame.

Nead scratched his head. ‘I know this guy . . . I think.’

Pallis laughed, rubbing his bruised chest. ‘Rees. I should have bloody known it would be you.’

Rees half opened his eyes; when he spoke his voice was dry as dust. ‘Hello, tree-pilot. I’ve had a hell of a trip.’

Pallis was embarrassed to find his eyes misting up. ‘I bet you did. You nearly missed, you damn idiot. It would have been easy if you hadn’t decided to turn somersaults on the way.’

‘I had every . . . confidence in you, my friend.’ Rees struggled to sit up. ‘Pallis, listen,’ he said.

Pallis frowned. ‘What?’

A smile twisted Rees’s broken lips. ‘It’s kind of difficult to explain. You have to take me to Hollerbach. I think I know how to save the world . . .’

‘You know what?’

Rees looked troubled. ‘He’s still alive, isn’t he?’

Pallis laughed. ‘Who, Hollerbach? They could no more get rid of that old bugger than they can get rid of you, it seems. Now lie back and I’ll take you home.’

With a sigh, Rees settled among the leaves.

By the time the tree had docked Rees seemed stronger. He emptied one of Pallis’s flasks of water and made inroads into a slab of meat-sim. ‘The whale flesh kept me alive in the short term, but who knows what vitamin and protein deficiencies I suffered . . .’

Pallis eyed his remaining food warily. ‘Just make sure you relieve your protein deficiencies before you start on my foliage.’

With Pallis’s support Rees slid down the tree’s tether cable to the deck. At the base Pallis said, ‘Now, come back to my cabin and rest before—’

‘There’s no time,’ Rees said. ‘I have to get to Hollerbach. There’s so much to do . . . we have to get started before we become too weak to act . . .’ His eyes flickered anxiously around the cable thicket. ‘ . . . It’s dark,’ he said slowly.

‘That’s a good word for it,’ Pallis said grimly. ‘Look, Rees, things haven’t got any better here. Decker’s in charge, and he’s neither a fool nor a monster; but the fact is that things are steadily falling apart. Maybe it’s already too late—’

Rees met his eyes with a look of clear determination. ‘Pilot, take me to Hollerbach,’ he said gently.

Pallis, surprised, felt invigorated by Rees’s answer. Under his physical weakness Rees had changed, become confident - almost inspiring. But then, given all his fantastic experiences, perhaps it would have been stranger if he hadn’t changed—

‘We don’t want any trouble, pilot.’

The voice came from the gloom of the cable thicket. Pallis stepped forward, hands on hips. ‘Who’s that?’

Two men stepped forward, one tall, both looming as wide as supply machines. They wore the ostentatiously ripped tunics that were the uniform of Committee functionaries.

‘Seel and Plath,’ Pallis groaned. ‘Remember these two clowns, Rees? Decker’s tame muscles . . . What do you boneheads want?’

Seel, short, square and bald, stepped forward, fmger stabbing at Pallis’s chest. ‘Now, look, Pallis, we’ve come for the miner, not you. I know we’ve

locked fists before . . .’

Pallis lifted his arms, letting the muscles bunch under his shirt. ‘We have, haven’t we?’ he said easily. ‘I’ll tell you what. Why don’t we finish it off? Eh?’

Seel took a pace forward.

Rees stepped between them. ‘Forget it, tree-pilot,’ he said sadly. ‘I’d have to face this crap sometime; let’s get it over . . .’

Plath took Rees’s arm, none too gently, and they began to make their way through the cable thicket. Rees’s footsteps were airy and unsteady.

Pallis shook his head angrily. ‘The poor bastard’s just hitched a ride on a whale, for God’s sake; can’t you let him be? Eh? Hasn’t he suffered enough?’

But - with only a last, longing stare from Seel - the little party walked away.

Pallis growled with frustration. ‘Finish up the work here,’ he spat at Nead.

Nead straightened from his work at the cable anchor. ‘Where are you going?’

‘After them, of course. Where else?’ And the tree-pilot stalked away through the cables.

By the time they’d reached the Platform Rees felt his gait become watery, wavering; his two captors weren’t so much restraining him, he thought wryly, as holding him up. After they climbed the shallow staircase to the deck of the Platform he murmured, ‘Thanks . . .’

Then he raised a heavy head and found himself staring at a battlefield. ‘By the Bones.’

‘Welcome to the Raft’s seat of government, Rees,’ Pallis said grimly.

Something crackled under Rees’s tread; he bent and picked up a smashed bottle, its glass scorched and half-melted. ‘More fire bombs? What’s happened here, pilot? Another revolt?’

Pallis shook his head. ‘Miners, Rees. We’ve been at this futile war since we lost the supply machine we sent to the Belt. It’s a stupid, bloody affair . . . I’m sorry you have to see this, lad.’

‘Well. What have we here?’ A vast belly quivered, close enough for Rees to feel its gross gravity field; it made him feel weak, insubstantial. He looked up into a broad, scarred face.

‘Decker . . .’

‘But you walked the beam. Didn’t you?’ Decker sounded vaguely puzzled, as if pondering a child’s riddle. ‘Or are you one of those I sent to the mine?’

Rees didn’t answer. He studied the Raft’s leader; Decker’s face was marked by deep creases and his eyes were hollow and restless. ‘You’ve changed,’ Rees said.

Decker’s eyes narrowed. ‘We’ve all bloody changed, lad.’

‘Mine rat. I thought I recognized you, clinging to that whale.’ The words were almost a hiss. Gover’s thin face was a mask of pure hatred, focused on Rees.

Rees suddenly felt enormously tired. ‘Gover. I never imagined I’d see you again.’ He looked into Gover’s eyes, recalling the last time he had seen the apprentice. It had been at the time of the revolt, he supposed, when Rees had silently joined the group of Scientists outside the Bridge. Rees remembered his contempt for the other man - and recalled how Gover had recognized that contempt, and how his thin cheeks had burned in response —

‘He’s an exile.’ Gover sidled up to Decker, his small fists clenching and unclenching. ‘I saw him approaching on the whale and had him brought to you. You threw him off the Raft. Now he’s back. And he’s a miner . . .’

‘So?’ Decker demanded.

‘Make the bastard walk the beam.’

Stray emotions chased like shadows across Decker’s complex, worn face. The man was tired, Rees realized suddenly; tired of the unexpected complexity of his role, tired of the blood, the endless privations, the suffering . . .

Tired. And looking for a few minutes’ diversion.

‘So you’d have him over the side, eh?’

Gover nodded, eyes still fixed on Rees.

Decker murmured, ‘Shame you weren’t so brave while the miners were in the sky.’ Gover flinched. A cruel smile surfaced through Decker’s tiredness. ‘All right, Gover. I agree with your judgement. But with one proviso.’

‘What?’

‘No beam. There’s been enough cowardly killing this shift. No. Let him die the way a man is meant to. Hand to hand.’ Gover’s eyes widened, shocked. Decker stepped back, leaving Rees and Gover facing each other. A small crowd gathered around them, a ring of bloodstained faces eager for distraction.

‘More bloody games, Decker?’

‘Shut up, Pallis.’

From the corner of his eye Rees saw the two heavies - Plath and Seel - clamp the tree-pilot’s arms tight.

Rees looked into Gover’s twisted, frightened face. ‘Decker, I’ve come a long way,’ he said. ‘And I’ve something to tell you . . . something more important than you can dream.’

Decker raised his eyebrows. ‘Really? I’ll be fascinated to hear about it . . . later. First, you fight.’

Gover crouched, hands spread like claws.

It seemed he had no choice. Rees raised his arms, tried to think himself into the fight. Once he could have taken Gover with one arm behind his back. But - after so many shifts with the Boneys and riding the whale - now he wasn’t sure . . .

Gover seemed to sense his doubt; his fear seemed to evaporate, and his posture adjusted subtly, became more aggressive. ‘Come on, mine rat.’ He stepped towards Rees.

Rees groaned inwardly. He didn’t have time for this. Come on, think; hadn’t he learned anything on his journey? How would a Boney handle this? He remembered the whale-spears lancing through the air with deadly accuracy—

‘Watch it, Gover,’ someone called. ‘He’s got a weapon.’

Rees found the half-bottle still in his hand . . . and an idea blossomed. ‘What, this? All right, Gover - hand to hand. Just you and me.’ He closed his eyes, felt the pull of the Raft and Platform play on the gravitational sense embedded in his stomach - then he hurled the glass as hard as he could, not quite vertically. It sparkled through the starlit air.

Gover showed his teeth; they were even and brown.

Rees stepped forward. Time seemed to slow, and the world around him froze; the only motion was the twinkling of the glass in the air above him. Everything became bright and vivid, as if illuminated by some powerful

lantern within his eyes. Detail overwhelmed him, sharp and gritty: he counted the beads of sweat on Gover's brow, saw how the apprentice's nostrils flared white as he breathed. Rees's throat tightened and he felt the blood pump in his neck; and all the while the half-bottle, small and graceful, was orbiting perfectly through the complex gravitational field . . .

Until, at last, it dipped back towards the deck. And slammed into Gover's back.

Gover went down howling. For some seconds he writhed on the deck, the blood pooling over the metal around him. Then, at last, he was still, and the blood ceased to flow.

For long moments nobody moved, Decker, Pallis and the rest forming a shocked tableau.

Rees knelt. Gover's back had been transformed into a mash of blood and torn cloth. Rees forced his hands into the wound and dug out the glass, then he stood holding aloft the grisly trophy, Gover's blood trickling down his arm.

Decker scratched his head. 'By the Bones . . .' He half laughed.

Rees felt a cold, hard anger course through him 'I know what you're thinking,' he told Decker quietly. 'You don't expect the likes of me to fight dirty. I cheated; I didn't follow the rules. Right?'

Decker nodded uncertainly.

'Well, this isn't a bloody game!' Rees screamed, spraying Decker's face with spittle. 'I wasn't going to let this fool kill me, not before I make you hear what I've got to say.

'Decker, you'll destroy me if you want to. But if you want any chance of saving your people you'll hear me out.' He brandished the glass in Decker's face.

'Has this earned me the right to be heard? Has it?'

Decker's mask of scars was impassive. He said quietly, 'You'd better take this one home, tree-pilot. Get him cleaned up.' With one last, narrow glare, he turned away.

Rees dropped the glass. Abruptly his fatigue crashed down. The deck seemed to quiver, and now it was rising to meet his face—

Arms around his shoulders and waist. He raised his head blearily. 'Pallis. Thanks . . . I had to do it, you see. You understand that, don't you?'

The tree-pilot would not meet his eyes; he stared at Rees’s bloody hands and shuddered.

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12

The Belt was a shabby toy hanging in the air above Pallis. Two plate craft hovered between Pallis's tree and the Belt; every few minutes they emitted puffs of steam and spurted a few yards through the clouds. Miners glared down from the craft across the intervening yards at the tree.

The craft were motes of iron in a vast pit of red-lit air. But, Pallis reflected with a sigh, they marked a wall as solid as any of wood or metal. He stood by the trunk of his tree and stared up at the sentries, rubbing his chin thoughtfully. 'Well, it's no use hanging about here,' he said. 'We'll have to go in.'

Jaen's broad face was smudged with soot from the fire bowls. 'Pallis, you're crazy. They're obviously not going to let us past.' She waved a muscular arm at the miners. 'The Raft and the Belt are at war, for goodness' sake!'

'The trouble with having you Science rejects as apprentice woodsmen is that you argue at every damn thing. Why the hell can't you just do as you're told?'

Jaen's broad face split into a grin. 'Would you rather have Gover back, pilot? You shouldn't complain if the revolution's brought you such a high calibre of staff.'

Pallis straightened up and dusted off his hands. 'All right, high calibre; we need to work. Let's get these bowls stoked.'

She frowned. 'You're serious? We're going on?'

'You heard what Rees said . . . What we have to tell these miners is possibly the most important news since the Ship arrived in the Nebula in the first place. And we're going to make those damn miners listen whether they like it or not. If that means we let them blast us out of the sky, then we accept it. And another tree will come, and that will be destroyed too; and then another, and another, until finally these damn fool mine rats work out that we really do want to talk to them.'

Throughout his awkward speech Jaen had kept her head down, fiddling with the kindling in a fire bowl; now she looked up. 'I suppose you're right.' She bit her lip. 'I just wish—'

'What?'

‘I just wish it wasn’t Rees who had come back from the dead to save the human race. That little mine rat was pompous enough as he was . . .’

Pallis laughed. ‘Fill your bowl, apprentice.’

Jaen set to work. Pallis took a silent pleasure in working with her. She was a good woodsman, fast and efficient; somehow she knew what to do without being told, and without getting in his damn way . . .

The blanket of smoke gathered beneath the platform of foliage. The tree rotated faster and surged up at the Belt, the air rushing through its foliage evoking sharp, homely scents in Pallis’s nostrils. The sentry craft were immobile shadows against the red sky. Pallis braced his legs against the trunk of his tree, the strength of the wood a comforting base below him, and cupped his hands to his mouth. ‘Miners!’

Faces scowled over the rim of each craft. Pallis, squinting, could make out weapons held ready: spears, knives, clubs.

He held his hands wide. ‘We come in peace! You can see that, for the love of the Bones. What do you think I’ve got, an armada tucked under my branches?’

Now a miner called down. ‘Piss off home, woodsman, before you get yourself killed.’

He felt a slow anger suffuse his scars. ‘My name is Pallis, and I’m not about to piss off anywhere. I’ve got news that will affect every man, woman and child on the Belt. And you’re going to let me deliver it!’

The miner scratched his head suspiciously. ‘What news?’

‘Let us through and I’ll tell you. It comes from one of your own. Rees —’

The miners conferred with each other; then the spokesman turned back to Pallis. ‘You’re lying. Rees is dead.’

Pallis laughed. ‘No, he isn’t; and his story is what my news is all about —’

With shocking suddenness a spear arced over the rim of the plate. He called a sharp warning to Jaen; the spear slid through the foliage and dwindled into the depths of the Nebula.

Pallis stood, hands on hips, and glared up at the miners. ‘You’re lousy listeners, aren’t you?’

‘Woodsman, we’re starving here because of Raft greed. And good men are dying trying to put that right—’

‘Let them die! No one asked them to attack the Raft!’ Jaen roared.

‘Shut up, Jaen,’ Pallis hissed.

She snorted. ‘Look, pilot, those bastards are armed and we aren’t. They’re obviously not listening to a damn word we say. If we try to get any closer they’ll probably just torch the tree with their jets. There’s no point in suicide, is there? We’ll just have to find another way.’

He rubbed his beard. ‘But there is no other way. We have to talk to them.’ And, without letting himself think about it, he reached out with one foot and kicked over the nearest fire bowl. The kindling spilled out, smoking, and soon tiny flames were licking at the foliage.

Jaen stared, motionless, for perhaps five seconds; then she broke into a flurry of motion. ‘Pallis, what the hell - I’ll get the blankets—’

He wrapped her forearm in one massive hand. ‘No, Jaen. Let it burn.’

She stared into his face, her expression blank and uncomprehending.

The flames spread like living things. Above them the miners stared down, evidently baffled.

Pallis found he had to lick his lips before he could speak. ‘The foliage is very dry, you see. It’s a consequence of the failing of the Nebula. The air is too arid; and the spectrum of starlight now isn’t suitable for photosynthesis in the leaves . . .’

‘Pallis,’ Jaen said firmly, ‘stop babbling.’

‘ . . . Yes. I’m gambling they’ll pick us up. It’s the only choice.’ He forced himself to study the blackened and twisting wood, the scorched leaves blowing in the air.

Jaen touched his scarred cheek; her fingertips came away damp. ‘This is really hurting you, isn’t it?’

He laughed painfully. ‘Jaen, it’s taking all my willpower to keep from the blankets.’ Suddenly anger coursed through his grief. ‘You know, of all the lousy, terrible things human beings do in this universe, this is the worst. People can do what they like to each other and I’ll turn away; but now I’m forced to destroy one of my own trees . . .’

‘You can let go of my arm.’

‘What?’ Surprised, he glanced down to find he still gripped her forearm. He released it. ‘I’m sorry.’

She rubbed her flesh ruefully. ‘I understand, tree-pilot; I won’t try to stop you.’ She held out her hand. With gratitude he took it, gently this time.

The platform lurched, making them both stumble. The flames at the heart of the blaze now stood taller than Pallis. ‘It’s happening fast,’ he murmured.

‘Yes. Do you think we should grab hold of some supply pods?’

The thought made him laugh out loud. ‘What, so we can take light snacks on our way down to the Core?’

‘OK, stupid idea. Not as stupid as setting fire to the bloody tree, though.’

‘Maybe you’ve a point.’

A complete section of the rim gave way now, disappearing in a shower of burning embers; truncated branches burned like fat candles. ‘I think it’s time,’ Pallis said.

Jaen peered about. ‘I guess the best strategy is to run to the rim and jump for it. Get as much speed as we can, and hope that that plus the rotation of the tree will take us far enough from all this debris.’

‘OK.’

They looked into each other’s eyes - and Pallis’s feet were pumping over the crisp foliage; the rim approached and he fought the instincts of a lifetime to stop and then the rim was under his feet and—

—and he was sailing through the empty, bottomless air, his hand still locked to Jaen’s.

It was almost exhilarating.

They tumbled, their flight slowing rapidly in the smoky air, and Pallis found himself hanging in the sky, feet towards the Belt, Jaen to his right, the tree before him.

The tree rim was a girdle of fire. Smoke billowed from the mass of foliage packed into the platform. With cracks like explosions the shaped branches failed and whole sectors of the disc, soaked in flame, came away with great rustles of sparks. Soon only the trunk remained, a gnarled remnant ringed by the stumps of its branches.

At last the disintegrated tree fell away into the sky, and Pallis and Jaen were left, hands still locked, hanging in a void.

The miners were nowhere to be seen.

Pallis looked at Jaen, oddly embarrassed. What, he wondered, should they talk about? ‘You know, Raft children grow up with a fear of falling,’ he said. ‘I guess the flat, steady surface beneath their feet gets taken for

granted. They forget that the Raft is no more than a leaf hovering in the air . . . nothing like as substantial as those huge, impossible planets in that other universe you Scientists tell us about.

‘But Belt children grow up on a tatty string of boxes circling a shrunken star. They have no safe plane to stand on. And their fear now wouldn’t be of falling, but of having nothing to hang on to . . .’

Jaen pushed her hair back from her broad face. ‘Pallis, are you frightened?’

He thought it over. ‘No. I don’t suppose I am. I was more frightened before I kicked the bloody fire bowl over.’

She shrugged, a mid-air gesture that made her body rock. ‘I don’t seem to be either. I only regret your gamble didn’t pay off—’

‘Well, it was worth a try.’

‘—And I’d love to know how it all works out in the end . . .’

‘How long do you think we’ll last?’

‘Maybe days. We should have brought food pallets. But at least we’ll get to see some sights - Pallis!’ Her eyes widened with shock; she let go of Pallis’s hand and began to make scrambling, swimming motions, as if trying to crawl up through the air.

Pallis, startled, looked down.

The hard surface of a mine sentry craft was flying up towards him; two miners clung to a net cast over the metal. The iron rushed at him like a wall —

There was a taste of blood in his mouth.

Pallis opened his eyes. He was on his back, evidently on the mine craft; he could feel the knots of the netting through his shirt. He tried to sit up - and wasn’t totally surprised to find his wrists and ankles bound to the net. He relaxed, trying to present no threat.

A broad, bearded face loomed over him. ‘This one’s all right, Jame; he landed on his head.’

‘Thanks a lot,’ Pallis snapped. ‘Where’s Jaen?’

‘I’m here,’ she called, out of his sight.

‘Are you OK?’

‘I would be if these morons would let me sit up.’

Pallis laughed - and winced as pain lanced through his mouth and cheeks. Evidently he would have a few new scars to add to his collection.

Now a second face appeared, upside down from Pallis's point of view. Pallis squinted. 'I remember you. I thought I recognized the name. Jame, from the Quartermaster's.'

'Hello, Pallis,' the barman said gloomily.

'Still watering your ale, barman?'

Jame scowled. 'You took a hell of a chance, tree-pilot. We should have let you drop . . .'

'But you didn't.' Pallis smiled and relaxed.

During the short journey with the miners to the Belt Pallis remembered his wonder on hearing Rees's tale for the first time. In his role as a friend of the returned exile, he had sat with Rees, Decker and Hollerbach in the old Scientist's office, eyes transfixed by the simple hand movements Rees used to emphasize aspects of his adventures.

It was so fantastic, the stuff of legends: the Boneys, the hollow world, the whale, the song . . . but Rees's tone was dry, factual and utterly convincing, and he had responded to all Hollerbach's questions with poise.

At last Rees reached his description of the whales' great migration. 'But of course,' Hollerbach breathed. 'Hah! It's so obvious.' And he banged his old fist into his desk top.

Decker jumped, startled out of his enthralment. 'You silly old fart,' he growled. 'What's obvious?'

'So many pieces fit into place. Internebular migrations . . . ! Of course; we should have deduced it.' Hollerbach got out of his chair and began to pace the room, thumping a bony fist into the palm of his hand.

'Enough histrionics, Scientist,' Decker said. 'Explain yourself.'

'First of all, the whales' songs: these old speculations which our hero has now confirmed. Tell me this: why should the whales have such sizable brains, such significant intelligence, such sophisticated communication? If you think it through they're basically just grazing creatures, and - by virtue of their sheer size - they are reasonably immune from the attentions of predators, as Rees testifies. Surely they need do little more than cruise through the atmosphere, munching air-bound titbits, needing barely more sense than, say, a tree - avoid this shadow, swim around that gravity well . . .'

Pallis rubbed the bridge of his nose. 'But a tree would never fly into the Core - not by choice anyway. Is that what you're saying?'

‘Exactly, tree-pilot. To submit oneself to such a regime of tidal stress and hazardous radiation clearly calls for a higher brain function, a far-sighted imperative to override the more elemental instincts, a high degree of communication - telepathic, perhaps - so that the correct behaviour may be instilled in each generation.’

Rees smiled. ‘Also a whale needs to select its trajectory around the Core quite precisely.’

‘Of course, of course.’

Decker’s face was a cloud of baffled anger. ‘Wait . . . Let’s take it one step at a time.’ He scratched, his beard. ‘What advantage do the whales gain by diving into the Core? Don’t they just get trapped down there?’

‘Not if they get the trajectory right,’ said Hollerbach, a little impatiently. ‘That’s the whole point . . . Do you see? It’s a gravitational slingshot. He held up a gaunt fist, mimed rotation by twisting it. ‘Here’s the Core, spinning away. And—’ The other hand was held flat; it swooped in towards the Core. ‘Here comes a whale.’ The model whale swooped past the Core, not quite touching, its hyperbolic path twisting in the same direction as the Core’s rotation. ‘For a brief interval whale and Core are coupled by gravity. The whale picks up a little of the Core’s angular momentum . . . It actually gains some energy from its encounter with the Core.’

Pallis shook his head. ‘I’m glad I don’t have to do that every time I fly a tree.’

‘It’s quite elementary. After all, the whales manage it . . . And the reason they go through all this is to pick up enough energy to reach the Nebula’s escape velocity.’

Decker thumped a fist onto the desk top. ‘Enough of your babbling. What is the relevance of all this?’

Hollerbach sighed; his fingers reached for the bridge of his nose, searching for long-vanished spectacles. The relevance is this. The whales can escape the Core’s gravity well - if they fall into another nebula, around another Core . . .’

‘They migrate,’ Rees said eagerly. ‘They travel to another nebula . . . A new one, with plenty of fresh stars, and a blue sky.’

‘We’re talking about a grand transmission of life among the nebulae,’ Hollerbach said. ‘No doubt the whales aren’t the only species which swim between the clouds . . . but even if they were they would probably carry

across enough spores and seedlings in their digestive systems to allow life to gain a new foothold.'

'It's all very exciting.' Rees seemed almost intoxicated. 'You see, the fact of migration solves another long-standing puzzle: the origin of life here. The Nebula is only a few million shifts old. There simply hasn't been time for life to evolve here in anything like the fashion we understand it did so on Earth.'

'And the answer to this puzzle,' Hollerbach said, 'turns out to be that it probably didn't evolve here after all.'

'It migrated to the Nebula from somewhere else?'

'That's right, tree-pilot; from some other, exhausted, cloud. And now this Nebula is finished; the whales know it is time to move on. There may have been other nebulae before the predecessor of our Nebula: a whole chain of migrations, reaching back in time as far as we can see.'

'It's a marvellous picture,' Rees said dreamily. 'Once life was established somewhere in this universe it must have radiated out rapidly; perhaps all the nebulae are already populated in some way, with unimaginable species endlessly crossing empty space—'

Decker stared from one Scientist to the other. He said quietly, 'Rees, if you don't come to the point - in simple words, and right now - so help me I'll throw you over the bloody Rim with my own bare hands. And the old fart. Got that?'

Rees spread his hands flat on the desk top, and again Pallis saw in his face that new, peculiar certainty. 'Decker, the point is - just as the whales can escape the death of the Nebula, so can we.'

Decker's frown deepened. 'Explain.'

'We have two choices.' Rees chopped the edge of his hand into the table. 'One. We stay here, watch the stars go out, squabble over the remaining scraps of food. Or—' Another chop. 'Two. We emulate the whales. We fall around the Core, use the slingshot effect. We migrate to a new nebula.'

'And how, precisely, do we do that?'

'I don't, precisely, know,' Rees said acidly. 'Maybe we cut away the trees, let the Raft fall into the Core.'

Pallis tried to imagine that. 'How would you keep the crew from being blown off?'

Rees laughed. ‘I don’t know, Pallis. That’s just a sketch; I’m sure there are better ways.’

Decker sat back, his scarred face a mask of intense concentration.

Hollerbach held up a crooked finger. ‘Of course you almost made the trip involuntarily, Rees. If you hadn’t found a way to deflect that whale, even now you’d be travelling among the star clouds with it.’

‘Maybe that’s the way to do it,’ Pallis said. ‘Cut our way into the whales, carry in food and water, and let them take us to our new home.’

Rees shook his head. ‘I don’t think that would work, pilot. The interior of a whale isn’t designed to support human life.’

Once more Pallis struggled with the strange ideas. ‘So we’ll have to take the Raft . . . but the Raft will lose all its air, won’t it, outside the Nebula? So we’ll have to build some sort of shell to keep in the atmosphere . . .’

Hollerbach nodded, evidently pleased. ‘That’s good thinking, Pallis. Maybe we’ll make a Scientist of you yet.’

‘Patronizing old bugger,’ Pallis murmured affectionately.

Again the fire burned in Rees. He turned his intense gaze on Decker. ‘Decker, somewhere buried in all this bullshit is a way for the race to survive. That’s what’s at stake here. We can do it; have no doubt about that. But we need your support.’ Rees fell silent.

Pallis held his breath. He sensed that he was at a momentous event, a turning point in the history of his species, and somehow it all hinged on Rees. Pallis studied the young Scientist closely, thought he observed a slight tremble of his cheeks; but Rees’s determination showed in his eyes.

At length Decker said quietly, ‘How do we start?’

Pallis let his breath out slowly; he saw Hollerbach smile, and a kind of victory shone in Rees’s eyes; but wisely neither of them exulted in their triumph. Rees said: ‘First we contact the miners.’

Decker exploded: ‘What?’

‘They’re humans too, you knew,’ Hollerbach said gently. ‘They have a right to life.’

‘And we need them,’ said Rees. ‘We’re likely to need iron. Lots of it . . .’

And so Pallis and Jaen had destroyed a tree, and now sat on a Belt rooftop. The star kernel hung above them, a blot in the sky; a cloud of rain

drizzled around them, plastering Pallis's hair and beard to his face. Sheen sat facing them, slowly chewing on a slab of meat-sim. Jame was behind her, arms folded. Sheen said slowly, 'I'm still not sure why I shouldn't simply kill you.'

Pallis grunted, exasperated. 'For all your faults, Sheen, I never took you for a fool. Don't you understand the significance of what I've travelled here to tell you?'

Jame smirked. 'How are we supposed to know it isn't some kind of trick? Pilot, you forget we're at war.'

'A trick? You explain how Rees survived his exile from the Belt - and how he came to ride home on a whale. Why, his tale comes close to the simplest hypothesis when you think about it.'

Jame scratched his dirt-crusted scalp. 'The what?'

Jaen smiled. Pallis said, 'I'll explain sometime . . . Damn it, I'm telling you the time for war is gone, barman. Its justification is gone. Rees has shown us a way out of this gas prison we're in . . . but we have to work together. Sheen, can't we get out of this bloody rain?'

The rain trickled down her tired face. 'You're not welcome here. I told you. You're here on sufferance. You're not entitled to shelter . . .'

Her words were much as they had been since Pallis had begun describing his mission here - but was her tone a little more uncertain? 'Look, Sheen, I'm not asking for a one-way deal. We need your iron, your metal-working skills - but you need food, water, medical supplies. Don't you? And for better or worse the Raft still has a monopoly on the supply machines. Now I can tell you, with the full backing of Decker, the Committee, and whoever bloody else you want me to produce, that we're willing to share. If you like we'll allocate you a sector of the Raft with its own set of machines. And in the longer term . . . we offer the miners life for their children.'

Jame leant forward and spat into the rain. 'You're full of crap, tree-pilot.'

Beside Pallis Jaen bunched a fist. 'You bloody clod—'

'Oh, shut up, both of you.' Sheen pushed wet hair from her eyes. 'Look, Pallis; even if I said "yes" that's not the end of it. We don't have a "Committee", or a boss, or any of that. We talk things out among us.'

Pallis nodded, hope bursting in his heart. ‘I understand that.’ He stared directly into Sheen’s brown eyes; he tried to pour his whole being, all their shared memories, into his words. ‘Sheen, you know me. You know I’m no fool, whatever else I’m guilty of . . . I’m asking you to trust me. Think it through. Would I have stranded myself here if I wasn’t sure of my case? Would I have lost something so precious as—’

Jame sneered. ‘As what, your worthless life?’

With genuine surprise Pallis turned to the barman. ‘Jame, I meant my tree.’

A complex expression crossed Sheen’s face. ‘Pallis, I don’t know. I need time.’

Pallis held up his palms. ‘I understand. Take all the time you want; speak to whoever you want. In the meantime . . . will you let us stay?’

‘You’re not stopping at the Quartermaster’s, that’s for sure.’

Pallis smiled serenely. ‘Barman, if I never sup your dilute piss again it will be too soon.’

Sheen shook her head. ‘You don’t change, do you, pilot? You know, even if - if - your story is true, your madcap scheme is full of holes.’ She pointed to the star kernel. ‘After working on that thing maybe we have a better feel for gravity than you people. I can tell you, that gravitational slingshot manoeuvre is going to be bloody tricky. You’ll have to get it just right . . .’

‘I know. And even as we sit here we’re getting some advice on that.’

‘Advice? Who from?’

Pallis smiled.

Gord woke to a sound of shouting.

He pushed himself upright from his pallet. He wondered vaguely how long he had slept . . . Here, of course, there was no cycle of shifts, no Belt turning like a clock - nothing to mark the time but sour sleep, dull, undemanding work, foul expeditions to the ovens. Still, the former engineer’s stomach told him that at least a few hours had elapsed. He looked to the diminishing pile of food stacked in the corner of his hut - and found himself shuddering. A little more time and perhaps he’d be hungry enough to eat more of the stuff.

The shouting grew in volume and a slow curiosity gathered in him. The world of the Boneys was seamless and incident-free. What could be causing

such a disturbance? A whale? But the lookouts usually spotted the great beasts many shifts before their arrival, and no song had been initiated.

Almost reluctantly he got to his feet and made his way to the door.

A crowd of a dozen or so Boneys, adults and children alike, stood on the leather surface of the world with faces upturned. One small child pointed skywards. Puzzled, Gord stepped out to join them.

Air washed down over him, carrying with it a scent of wood and leaves that briefly dispersed the taint of corruption in his nostrils. He looked up and gasped.

A tree rotated in the sky. It was grand and serene, its trunk no more than fifty yards above him.

Gord hadn't seen a tree since his exile from the Belt. Perhaps some of these Boneys had never seen one in their lives.

A man dangled upside down from the trunk, dark, slim and oddly familiar. He was waving. 'Gord? Is that you . . .?'

'Rees? It can't be . . . You're dead. Aren't you?'

Rees laughed. 'They keep telling me I ought to be.'

'You survived your jump to the whale?'

'More than that . . . I made it back to the Raft.'

'You're not serious.'

'It's a long story. I've travelled from the Raft to see you.'

Gord shook his head and spread his hands to indicate the sack of bones that was his world. 'If that's true, you're crazy. Why come back?'

Rees called, 'Because I need your help . . .'

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13

On clouds of steam the plate ship swam towards the Belt. Sheen and Grye stood at the entrance to the Quartermaster's and watched it approach with its cargo of Boneys. Sheen felt dread build up in her, and she shuddered.

She turned to Grye. When the Scientist had first been exiled here by the Raft he had been quite portly, Sheen remembered; now the skin hung from his bones in folds, as if emptied of substance. He caught her studying him. He shifted his drink bowl from hand to hand and dropped his eyes.

Sheen laughed. 'I believe you're blushing.'

'I'm sorry.'

'Look, you've got to lighten up. You're one of us now, remember. Here we are, all humans together, the past behind us. It's a new world. Right?'

He flinched. 'I'm sorry . . .'

'Stop saying that.'

'It's just that it's hard to forget the hundreds of shifts we have had to endure since coming here.' His voice was mild, but somewhere buried in there was a spark of true bitterness. 'Ask Roch if the past is behind us. Ask Cipse.' Now Sheen felt her own face redden. Reluctantly she recalled her own hatred for the exiles, how she had willingly allowed their cruel treatment to continue. A hot shame coursed through her. Now that Rees had changed the perspective - given the whole race, it seemed, a new goal - such actions seemed worse than contemptible.

With an effort she forced herself to speak. 'If it means anything, I'm sorry.'

He didn't reply.

For some moments they stood in awkward silence. Grye's posture softened a little, as if he felt a little more comfortable in her company.

'Well,' Sheen said briskly, 'at least Jame isn't barring you from the Quartermaster's any more.'

'We should be grateful for small mercies.' He took a sip from his bowl and sighed. 'Not so small, maybe . . .' He indicated the approaching plate. 'You miners do seem to have accepted us a lot more easily since the first Boneys arrived.'

‘I can understand that. Perhaps the presence of the Boneys shows the rest of us how much we have in common.’

‘Yes.’

The Belt’s rotation carried the Quartermaster’s beneath the approaching plate once again. Sheen could see that the little craft carried three Boneys, two men and a woman. They were all squat and broad, and they wore battered tunics provided by the Belt folk. Sheen had heard legends of what they chose to wear on their home worldlet . . . She found herself shuddering again.

The Belt was being used as a way station between the Bone world and the Raft; Boneys travelling to the Raft would stay here for a few shifts before departing on a supply tree. At any one time there was, Sheen reminded herself, only a handful of Boneys scattered around the Belt . . . but most miners felt that handful was too many.

The Boneys stared down at her, thick jaws gaping. One of the men caught Sheen’s eye. He winked at her and rolled his hips suggestively. She found her food rising to her throat; but she held his stare until the plate had passed over the Belt’s narrow horizon. ‘I wish I could believe we need those people,’ she muttered.

Grye shrugged. ‘They are human beings. And, according to Rees, they didn’t choose the way they live. They have just tried to survive, as we all must do . . . Anyway, we might not need them. Our work with the Moles on the star kernel is proceeding well.’

‘Really?’

Grye leaned closer, more confident now that the conversation had moved onto a topic he knew about. ‘You understand what we’re trying to do down there?’

‘Vaguely . . .’

‘You see, if Rees’s gravitational slingshot idea is going to work we will have to drop the Raft onto a precise trajectory around the Core. The asymptotic direction is highly sensitive to the initial conditions—’

She held up her hands. ‘You’d better stick to words of one syllable. Or less.’ ‘I’m sorry. We’re going into a tight orbit, very close to the Core. The closer we pass, the more our path will be twisted around the Core. But the differences for a small deviation are dramatic. You have to imagine a pencil of neighbouring trajectories approaching the Core. As they round the

singularity they fan out, like unravelling fibres; and so a small error could give the Raft a final direction very different from the one we want.'

'I understand . . . I think. But it doesn't make much difference, surely? You're aiming at a whole nebula, a target thousands of miles wide.'

'Yes, but it's a long way away. It's quite a precise piece of marksmanship. And if we miss, by even a few miles, we could end up sailing into empty, airless space, on without end . . .'

'So how is the Mole helping?'

'What we need to do is work out all the trajectories in that pencil, so we can figure out how to approach the Core. It takes us hours to work the results by hand - work which, apparently, was performed by slavelike machines for the original Crew. It was Rees who had the idea of using the Mole brains.'

Sheen pulled a face. 'It would be.'

'He argued that the Moles must once have been flying machines. And if you look closely you can see where the rockets, fins and so on must have fitted. So, argued Rees, the Moles must understand orbital dynamics, to some extent. We tried putting our problems to a Mole. It took hours of question-and-answer down there on the kernel surface . . . but at last we started getting usable results. Now the Mole provides concise answers, and we're proceeding quickly.'

She nodded, juggling her drink. 'Impressive. And you're sure of the quality of the results?'

He seemed to bridle a little. 'As sure as we can be. We've checked samples against hand calculations. But none of us are experts in this particular field.' His voice hardened again. 'Our Chief Navigator was Cipse, you see.'

She could think of no reply. She drained the last of her globe. 'Well, look, Grye, I think it's time I—'

'Now, then, where can old Quid take a drink around here?'

The voice was low and sly. She turned, startled, and found herself looking down at a wide, wrinkled face; a grin revealed rotten stumps of teeth. She couldn't help but shrink away from the Boney. Vaguely she was aware of Grye quailing beside her. 'What . . . do you want?'

The Boney stroked a finely carved spear of bone. His eyes widened in mock surprise. 'Why, darling, I've only just arrived, and what kind of

welcome is that? Eh? Now that we're all friends together . . .' He took a step closer. 'You'll like old Quid when you get to know him—'

She stood her ground and let her disgust show in her face. 'You come any nearer to me and I'll break your bloody arm.'

He laughed evenly. 'I'd be interested to see you try, darling. Remember I grew to my fine stature in high-gee . . . not this baby-soft micro gravity you have here. You're muscled very attractively; but I bet your bones are as brittle as dead leaves.' He looked at her acutely. 'Surprised to find old Quid using phrases like "micro gravity", girl? I may be a Boney, but I'm not a monster; nor am I stupid.' He reached out and grabbed her forearm. His grip was like iron. 'It's a lesson you evidently need to learn—'

She thrust at the wall of the Quartermaster's with both legs and performed a fast back flip, shaking free his hand. When she landed she had a knife in her fist.

He held up his hands with an admiring grin. 'All right, all right . . .' Now Quid turned his gaze on Grye; the Scientist clutched his drink globe to his chest, trembling. 'I heard what you were saying,' Quid said. 'All that stuff about orbits and trajectories . . . But you won't make it, you know.'

Grye's cheeks quivered and stretched. 'What do you mean?'

'What are you going to do when you're riding your bit of iron, down there by the Core himself - and you find you're on a path that isn't in your tables of numbers? At the critical moment - at closest approach - you'll have maybe minutes to react. What will you do? Turn back and draw some more curves on paper? Eh?'

Sheen snorted. 'You're an expert, are you?'

He smiled. 'At last you're recognizing my worth, darling.' He tapped his head. 'Listen to me. There's more on orbits locked in here than on all the bits of paper in the Nebula.'

'Rubbish,' she spat.

'Yes? Your little friend Rees doesn't think so, does he?' He hefted his spear in his right hand; Sheen kept her eyes on the spear's bone tip. 'But then,' Quid went on, 'Rees has seen what we can do with these things—'

Abruptly he twisted so that he faced the star kernel; with surprising grace he hurled the spear. The weapon accelerated into the five-gee gravity well of the kernel. Moving so fast that it streaked in Sheen's vision, it missed the iron horizon by mere yards and twisted behind the star—

—and now it emerged from the other side of the kernel, exploding at her like a fist. She ducked, grabbing for Grye; but the spear passed a few yards above her head and sailed away into the air.

Quid sighed. ‘Not quite true. Old Quid needs to get his eye in. Still—’ He winked. ‘Not bad for a first try, eh?’ He prodded Grye’s sagging paunch. ‘Now, that’s what I call orbital dynamics. And all in old Quid’s head. Astonishing, isn’t it? And that’s why you need the Boneys. Now then, Quid needs his drink. See you later, darling . . .’

And he brushed past them and entered the Quartermaster’s.

Gord shoved his thinning blond hair from his eyes and thumped the table. ‘It can’t be done. I know what I’m talking about, damn it.’

Jaen towered over the little engineer. ‘And I’m telling you you’re wrong.’

‘Child, I’ve more experience than you will ever—’

‘Experience?’ She laughed. ‘Your experience with the Boneys has softened your brains.’

Now Gord stood. ‘Why, you—’

‘Stop, stop.’ Tiredly Hollerbach placed his age-spotted hands on the table top.

Jaen simmered. ‘But he won’t listen.’

‘Jaen. Shut up.’

‘But - ah, damn it.’ She subsided.

Hollerbach let his gaze roam around the cool, perfect lines of the Bridge’s Observation Room. The floor was covered with tables and spread-out diagrams: Scientists and others bent over sketches of orbital paths, models of grandiose protective shells to be built around the Raft, tables showing rates of food consumption and oxygen exhaustion under various regimes of rationing. The air was filled with feverish, urgent conversation. Wistfully, Hollerbach recalled the studied calm of the place when he had first joined the great Class of Scientists; in those days there had still been some blue in the sky, and there had seemed all the time in the world for him to study . . .

At least, he reflected, all this urgent effort was in the right direction, and seemed to be producing the results they needed to carry through this scheme. The tables and dry graphs told a slowly emerging tale of a modified Raft hurtling on a courageous trajectory around the Core; these

sober Scientists and their assistants were together engaged on man's most ambitious project since the building of the Raft itself.

But now Gord had walked in with his scraps of paper and his pencil jottings . . . and his devastating news. Hollerbach forced his attention back to Gord and Jaen, who still confronted each other - and he found his eyes meeting Decker's. The Raft's leader stood impassively before the table, his scarred face clouded by a scowl of concentration.

Hollerbach sighed inwardly. Trust Decker, with his instinct for the vital, to arrive at the point of crisis. 'Let's go through it again, please, engineer,' he said to Gord. 'And this time, Jaen, try to be rational. Yes? Insults help nobody.'

Jaen glowered, her broad face crimson.

'Scientist, I am - was - the Belt's chief engineer,' Gord began. 'I know more than I care to remember about the behaviour of metals under extreme conditions. I've seen it flow like plastic, turn brittle as old wood . . .'

'No one is questioning your credentials, Gord,' Hollerbach said, unable to contain his irritation. 'Get to the point.'

Gord tapped his papers with his fingertips. 'I've studied the tidal stresses the Raft will undergo at closest approach. And I've considered the speeds it must attain after the slingshot, if it's to escape the Nebula. And I can tell you, Hollerbach, you haven't a hope in hell. It's all here; you can check it out—'

Hollerbach waved his hand. 'We will, we will. Just tell us.'

'First of all, the tides. Scientist, the stresses will rip this Raft to pieces, long before you get to closest approach. And the fancy structures your bright kids are planning to erect over the deck will simply blow apart like a pile of twigs.'

'Gord, I don't accept that,' Jaen burst out. 'If we reconfigure the Raft, perhaps buttress some sections, make sure our attitude is correct at closest approach—'

Gord returned her gaze and said nothing.

'Check his figures later, Jaen,' Hollerbach said. 'Go on, engineer.'

'Also, what about air resistance? At the speeds required, down there in the thickest air of the whole Nebula, whatever shoal of fragments emerges from closest approach is simply going to burn up like so many meteors. You'll achieve a spectacular fireworks display and little more. Look, I'm

sorry this is so disappointing, but your scheme simply cannot work. The laws of physics are telling you that, not me . . .'

Decker leaned forward. 'Miner, he said softly, 'if what you say is true then we may after all be doomed to a slow death in this stinking place. Now, maybe I'm a poor judge of people, but you don't seem too distressed by the prospect. Do you have an alternative suggestion?'

A slow smile spread over Gord's face. 'Well, as it happens . . .'

Hollerbach sat back, letting his jaw drop. 'Why the hell didn't you tell us in the first place?'

Gord's grin widened. 'If you'd troubled to ask—'

Decker laid a massive hand on the table. 'No more word games,' he said quietly. 'Miner, get on with it.'

Gord's grin evaporated; shadows of fear chased across his face, reminding Hollerbach uncomfortably of how much this blameless little man had endured. 'Nobody's threatening you,' he said. 'Just show us.'

Looking more comfortable, Gord stood and led them out of the Bridge. Soon the four of them - Gord, Hollerbach, Decker and Jaen - stood beside the dull glow of the Bridge's hull; the starlight beat down, causing beads of perspiration to erupt over Hollerbach's bald scalp. Gord stroked the hull with his palm. 'When was the last time you touched this stuff? Perhaps you walk past it every day, taking it for granted; but when you come at it fresh, it's quite a revelation.'

Hollerbach pressed his hand to the silver surface, feeling his skin glide smoothly over it . . . 'It's frictionless. Yes. Of course.'

'You tell me this was once a vessel in its own right, before it was incorporated into the deck of the Raft,' Gord went on. 'I agree with you. And furthermore, I think this little ship was designed to travel through the air.'

'Frictionless,' Hollerbach breathed again, still rubbing his palm over the strange metal. 'Of course. How could we all have been so stupid? You see,' he told Decker, 'this surface is so smooth the air will simply slide over it, no matter what speed it travels. And it won't heat up as would ordinary metal . . .

'And no doubt this structure would be strong enough to survive the tidal stresses close to the Core; far better, at least, than our ramshackle covered Raft. Decker, obviously we'll have to go through Gord's calculations, but I

think we'll find he's correct. Do you see what this means?' Something like wonder coursed through Hollerbach's old brain. 'We'll have no need to build an iron bell to keep our air in place. We can simply close the Bridge port. We will ride a ship as our ancestors rode . . . Why, we can even use our instruments to study the Core as we pass. Decker, a door has closed; but another has opened. Do you understand?'

Decker's face was a dark mask. 'Oh, I understand, Hollerbach. But there's another point you might have missed.'

'What?'

'The Raft is half a mile wide. This Bridge is merely a hundred yards long.'

Hollerbach frowned; then the implications began to hit him.

'Find Rees,' Decker snapped. 'I'll meet you both in your office in a quarter of an hour.' With a curt nod, he turned and walked away.

Rees found the atmosphere in Hollerbach's office electric.

'Close the door,' Decker growled.

Rees sat before Hollerbach's desk. Hollerbach sat opposite, long fingers pulling at the papery skin of his hands. Decker sucked breath through his wide nostrils; eyes downcast, he paced around the small office.

Rees frowned. 'Why the funereal atmosphere? What's happened?'

Hollerbach leaned forward. 'We have a . . . complication.' He sketched out Gord's reservations. 'We have to check his figures, of course. But—'

'But he's right,' Rees said. 'You know he is, don't you?'

Hollerbach sighed, the air scraping over his throat. 'Of course he's right. And if the rest of us hadn't got carried away with glamorous speculations about gravitational slingshots and a mile-wide dome, we'd have asked the same questions. And come to the same conclusions.'

Rees nodded. 'But if we use the Bridge we're facing problems we didn't anticipate. We thought we could save everybody.' His eyes flicked to Decker. 'Now we have to choose.'

Decker's face was dark with anger. 'And so you turn to me.'

Rees rubbed the space between his eyes. 'Decker, provided we manage the departure cleanly those left behind will survive for hundreds, thousands of shifts—'

'I hope those abandoned by your shining ship will take it so philosophically,' Decker spat. 'Scientists. Answer me this. Will this

adventure work? Could the passengers of the Bridge actually survive a passage around the Core, and then through space to the new nebula? We're looking at a very different set-up from Rees's original idea.'

Rees nodded slowly. 'We'll need supply machines, whatever compressed air we can carry in the confines of the Bridge, perhaps plants to convert stale air to—'

'Spare me the trivia,' Decker snapped. 'This absurd project will entail back-breaking labour, injury, death. And no doubt the departing Bridge will siphon off many of mankind's best brains, worsening the lot of those left behind still further.

'If this mission does not have a reasonable chance of success then I won't back it. It's as simple as that. I won't shorten the lives of the bulk of those I'm responsible for, solely to give a few heroes a pleasure ride.'

'You know,' Hollerbach said thoughtfully, 'I doubt that when you - ah, acquired - power on this Raft you imagined having to face decisions like this.'

Decker scowled. 'Are you mocking me, Scientist?'

Hollerbach closed his eyes. 'No.'

'Let's think it through,' Rees said. 'Hollerbach, we need to transport a genetic pool large enough to sustain the race. How many people?'

Hollerbach shrugged. 'Four or five hundred?'

'Can we accommodate so many?'

Hollerbach paused before answering. 'Yes,' he said slowly. 'But it will take careful management. Strict planning, rationing . . . It will be no pleasure ride.'

Decker growled, 'Genetic pool? Your five hundred will arrive like babies in the new world, without resources. Before they breed they will have to find a way of not falling into the Core of the new nebula.'

Rees nodded. 'Yes. But so did the Crew of the original Ship. Our migrants will be worse off materially . . . but at least they will know what to expect.'

Decker drove his fist into his thigh. 'So you're telling me that the mission can succeed, that a new colony could survive? Hollerbach, you agree?'

'Yes,' Hollerbach said quietly. 'We have to work out the details. But - yes. You have my assurance.'

Decker closed his eyes and his great shoulders slumped. ‘All right. We must continue with your scheme. And this time, try to foresee the problems.’

Rees felt a vast relief. If Decker had decided otherwise - if the great goal had been taken away - how would he, Rees, have whiled away the rest of his life?

He shuddered. It was unimaginable.

‘Now we face further actions,’ Hollerbach said. He held up his skeletal hand and counted points on his fingers. ‘Obviously we must continue our studies on the mission itself - the equipage, separation, guidance of the Bridge. For those left behind, we have to think about moving the Raft.’

Decker looked surprised.

‘Decker, that star up there isn’t going to go away. We’d have shifted out from under it long ago, in normal times. Now that the Raft is fated to stay in this Nebula, we must move it. And finally . . .’ Hollerbach’s voice tailed away.

‘And finally,’ Decker said bitterly, ‘we have to think about how to select those who travel on the Bridge. And those who stay behind.’

Rees said, ‘Perhaps some kind of ballot would be fair . . .’

Decker shook his head. ‘No. This jaunt will only succeed if you have the right people.’

Hollerbach nodded. ‘You’re right, of course.’

Rees frowned. ‘ . . . I guess so. But - who selects the “right” crew?’

Decker glared at him, the scars on his face deepening into a mask of pain. ‘Who do you think?’

Rees cradled his drink globe. ‘So that’s it,’ he told Pallis. ‘Now Decker faces the decision of his life.’

Pallis stood before his cage of young trees, poked at the wooden bars. Some of the trees were almost old enough to release, he reflected absently. ‘Power brings responsibility, it seems. I’m not certain Decker understood that when he emerged on top from that joke Committee. But he sure understands it now . . . Decker will make the right decision; let’s hope the rest of us do the same.’

‘What do you mean, the rest of us?’

Pallis lifted the cage from its stand; it was light, if bulky, and he held it out to Rees. The young Scientist put down his drink globe and took the cage

uncertainly, staring at the agitated young trees. ‘This should go on the journey,’ Pallis said. ‘Maybe you should take more. Release them into the new nebula, let them breed - and, in a few hundred shifts, whole new forests will begin to form. If the new place doesn’t have its own already . . .’

‘Why are you giving this to me? I don’t understand, tree-pilot.’

‘But I do,’ Sheen said.

Pallis whirled. Rees gasped, juggling the cage in his shock.

She stood just inside the doorway, diffuse starlight catching the fine hairs on her bare arms.

Pallis, with hot shame, felt himself blush; seeing her standing there, in his own cabin, made him feel like a clumsy adolescent. ‘I wasn’t expecting you,’ he said lamely.

She laughed. ‘I can see that. Well, am I not to be invited in? Can’t I have a drink?’

‘Of course . . .’

Sheen settled comfortably to the floor, crossing her legs under her. She nodded to Rees.

Rees looked from Pallis to Sheen and back, his colour deepening. Pallis was surprised. Did Rees have some feeling for his former supervisor . . . even after his treatment during his return exile on the Belt? Rees stood up, awkwardly fumbling with the cage. ‘I’ll talk to you again, Pallis—’

‘You don’t have to go,’ Pallis said quickly.

Sheen’s eyes sparkled with amusement.

Again Rees looked from one to the other. ‘I guess it would be for the best,’ he said. With mumbled farewells, he left.

Pallis handed Sheen a drink globe. ‘So he’s carrying a torch for you.’

‘Adolescent lust,’ she said starkly.

Pallis grinned. ‘I can understand that. But Rees is no adolescent.’

‘I know that. He’s become determined, and he’s driving us all ahead of him. He’s the saviour of the world. But he’s also a bloody idiot when he wants to be.’

‘I think he’s jealous . . .’

‘Is there something for him to be jealous of, tree-pilot?’

Pallis dropped his eyes without reply.

‘So,’ she said briskly, ‘you’re not travelling on the Bridge. That was the meaning of your gift to Rees, wasn’t it?’

He nodded, turning to the space the cage had occupied.

‘There’s not much of my life left,’ he said slowly. ‘My place on that Bridge would be better given to some youngster.’

She reached forward and touched his knee; the feeling of her flesh was electric. ‘They’ll only invite you to go if they think they need you.’

He snorted. ‘Sheen, by the time those caged skitters have grown, my stiffening corpse will long since have been hurled over the Rim. And what use will I be without a tree to fly?’ He pointed to the flying forest hidden by the cabin’s roof.

‘My life is the forest up there. After the Bridge goes, the Raft will still be here, for a long time to come. And they’re going to need their trees.’

She nodded. ‘Well, I understand, even if I don’t agree.’ She fixed him with her clear eyes. ‘I guess we can debate it after the Bridge has gone.’

He gasped; then he reached out and took her hand. ‘What are you talking about? Surely you’re not planning to stay too? Sheen, you’re crazy —’

‘Tree-pilot,’ she snapped, ‘I did not insult you on the quality of your decision.’ She let her hand rest in his. ‘As you said, the Raft is going to be here for a long time to come. And so is the Belt. It’s going to be grim after the Bridge departs, taking away - all our hope. But someone will have to keep things turning. Someone will have to call the shift changes. And, like you, I find I don’t want to leave behind my life.’

He nodded. ‘Well, I won’t say I agree—’

She said warningly, ‘Tree-pilot—’

‘But I respect your decision. And—’ He felt the heat rise to his face again.

‘And I’m glad you’ll still be here.’

She smiled and moved her face closer to his. ‘What are you trying to say, tree-pilot? ’

‘Maybe we can keep each other company.’

She reached up, took a curl of his beard, and tugged it gently. ‘Yes. Maybe we can.’

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14

A cage of scaffolding obscured the Bridge's clean lines. Crew members crawled over the scaffolding fixing steam jets to the Bridge's hull. Rees, with Hollerbach and Grye, walked around the perimeter of the work area. Rees assessed the project with a critical eye. 'We're too slow, damn it.'

Grye twisted his hands together. 'Rees, I'm forced to say that your detailed understanding of this project is woefully lacking. Come—' He beckoned. 'Let me show you how much progress we have made.' He slapped a plump hand against the wooden cage surrounding the Bridge; it was a rectangular box securely fastened to the deck, and it supported three broad hoops which wrapped around the Bridge itself. 'We can't take chances with this,' Grye said. 'The last stage in the launch process will be the cutting away of the Bridge from the deck. When that is done, all that will support the Bridge will be this scaffolding. A mistake made here could cause catastrophic—'

'I know, I know,' Rees said, irritated. 'But the fact is we're running out of time . . .'

They came to the Bridge's open port. Under the supervision of Jaen and another Scientist, two burly workmen were manhandling an instrument out of the Observatory. The instrument - a mass spectrometer, Rees recognized - was dented and scratched, and its power lead terminated in a melted stump. The spectrometer was placed with several others in an eerie group some yards from the Bridge; the discarded instruments turned blinded sensors to the sky.

Hollerbach shuddered. 'And this is something I certainly hesitate over,' he said, his voice strained. 'We face an awful dilemma. Every instrument we vandalize and throw out gives us floor space and air for another four or five people. But can we afford to leave behind this telescope, that spectrometer? Is this device a mere luxury - or, in the unknown environs of our destination, will we leave ourselves blind in some key spectrum?'

Rees suppressed a sigh. Hesitation, delays, obfuscations, more delays . . . Obviously the Scientists could not metamorphose into men of action in mere hours - and he sympathized with the dilemmas they were trying to resolve - but he wished they could learn to establish and stick to priorities.

Now they came to a group of Scientists probing cautiously at a food machine. The huge device loomed over them, its outlets like stilled mouths. Rees knew that the machine was too large to carry into the Bridge's interior, and so it - and a second companion machine - would, rather absurdly, have to be lodged close to the port in the Bridge's outer corridor.

Grye and Hollerbach both made to speak, but Rees held up his hands. 'No,' he said acidly. 'Let me go into the reasons why we can't possibly rush this particular process. We've calculated that if strict rationing is imposed during the flight two machines should satisfy our needs. This one even has an air filtration and oxygenation unit built into it, we've discovered . . .'

'Yes,' Grye said eagerly, 'but that calculation depends on a key assumption: that the machines will work at full efficiency inside the Bridge. And we don't know enough about their power supply to be sure. We know this machine's power source is built into it somehow - unlike the Bridge instruments, which shared a single unit by way of cables - and we even suspect, from the old manuals, that it's based on a microscopic black hole - but we're not sure. What if it requires starlight as a source of replenishment? What if it produces volumes of some noxious gas which, in the confines of the Bridge, will suffocate us all?'

Rees said, 'We have to test and be sure, I accept that. If the efficiency of the machine goes down by just ten per cent - then that's fifty more people we have to leave behind.'

Grye nodded. 'Then you see—'

'I see that these decisions take time. But time is what we just don't have, damn it . . .' Pressure built inside him: a pressure which, he knew, would not be relieved until, for better or worse, the Bridge was launched.

Walking on, they met Gord. The mine engineer and Nead, who was working as his assistant, were carrying a steam jet unit to the Bridge. Gord nodded briskly. 'Gentlemen.'

Rees studied the little mine engineer, his worries momentarily lifting. Gord had returned to his old efficient, bustling, slightly prickly self; he was barely recognizable as the shadow Rees had found on the Boneys' worldlet. 'You're doing well, Gord.'

Gord scratched his bald pate. 'We're progressing,' he said lightly. 'I'll say no more than that; but, yes, we're progressing.'

Hollerbach leaned forward, hands folded behind his back. ‘What about this control system problem?’

Gord nodded cautiously. ‘Rees, are you up to date on this one? To direct the Bridge’s fall - to change its orbit - we need some way to control the steam jets we’ll have fixed to the hull; but we don’t want to make any breaches in the hull through which to pass our control lines. We don’t even know if we can make breaches, come to that.

‘Now it looks as if we can use components from the cannibalized Moles. Some of their motor units operate on an action-at-a-distance principle. I’m just a simple engineer; maybe you Scientists understand the ins and outs of it. But what it boils down to is that we may be able to operate the jets from inside the Bridge with a series of switches which won’t need any physical connection to the jets at all. We’re about to run tests on the extent to which the hull material blocks the signals.’

Hollerbach smiled. ‘I’m impressed. Was this your idea?’

‘Ah . . .’ Gord scratched his cheek. ‘We did get a little guidance from a Mole brain. Once you ask the right questions - and get past its complaints about “massive sensor dysfunction” - it’s surprising how . . .’ His voice tailed away and his eyes widened.

‘Rees.’ The vast voice came from behind Rees; the Scientist stiffened. ‘I thought I’d find you hanging around here.’

Rees turned and lifted his face up to Roch’s. The huge miner’s eyes were, as ever, red-rimmed with inchoate anger; his fists opened and closed like pistons. Grye whimpered softly and edged behind Hollerbach. ‘I have work to do, Roch,’ Rees said calmly. ‘So must you; I suggest you return to it.’

‘Work?’ Roch’s filth-rimmed nostrils flared and he waved a fist at the Bridge. ‘Like hell will I work so you and your pox-ridden friends can fly off in this fancy thing.’

Hollerbach said sternly, ‘Sir, the lists of passengers have not yet been published; and until they are it is up to all of us—’

‘They don’t need to be published. We all know who’ll be on that trip . . . and it won’t be the likes of me. Rees, I should have sucked your brains out of your skull while I had the chance down on the kernel.’ Roch held up a rope-like finger. ‘I’ll be back: he growled. ‘And when I find I’m not on that

list I’m going to make damn sure you’re not either.’ He stabbed the finger at Grye. ‘And the same goes for you!’

Grye turned ash white and trembled convulsively.

Roch stalked off. Gord hefted his jet and said wryly, ‘Good to know that in this time of upheaval some things have stayed exactly the same. Come on, Nead; let’s get this thing mounted.’

Rees faced Hollerbach and Grye. He jabbed a thumb over his shoulder towards the departed Roch. ‘That’s why we are running out of time,’ he said. ‘The political situation on this Raft - no, damn it, the human situation - is deteriorating fast. The whole thing is unstable. Everyone knows that a “list” is being drawn up . . . and most people have a good idea who’ll be on it. How long can we expect people to work towards a goal most of them cannot share? A second uprising would be catastrophic. We would descend into anarchy—’

Hollerbach emitted a sigh; suddenly he seemed to stagger. Grye took his arm. ‘Chief Scientist - are you all right?’

Hollerbach fixed rheumy eyes on Rees. ‘I’m tired, you see . . . terribly tired. You’re right, of course, Rees, but what can any of us do, other than give our best efforts to this goal?’ Rees realized suddenly that he had been unloading his own doubts onto the weakening shoulders of Hollerbach, as if he were still a child and the old man some kind of impregnable adult. ‘I’m sorry, he said. ‘I shouldn’t burden you—’

Hollerbach waved a shaky hand. ‘No, no; you’re quite right. In a way it helps clarify my own thinking. His eyes twinkled with a faint amusement. ‘Even your friend Roch helps, in a way. Look at the comparison between us. Roch is young, powerful; I’m too old to stand up - let alone to pass on my frailties to a new generation. Which of us should go on the mission?’

Rees was appalled. ‘Hollerbach, we need your understanding. You’re not suggesting . . .’

‘Rees, I suspect a grave flaw in the way we live our lives here has been our refusal to accept our place in the universe. We inhabit a world which places a premium on physical strength and endurance - as your friend Roch so ably demonstrates - and on agility, reflex and adaptability - for example, the Boneys - rather than “understanding”. We are little more than clumsy animals lost in this bottomless sky. But our inheritance of ageing gadgetry from the Ship, the supply machines and the rest, has let us maintain the

illusion that we are masters of this universe, as perhaps we were masters of the world man came from.

‘Now, this enforced migration is going to force us to abandon most of our cherished toys - and with them our illusions.’ He looked vaguely into the distance. ‘Perhaps, looking far into man’s future, our big brains will atrophy, useless; perhaps we will become one with the whales and sky wolves, surviving as best we can among the flying trees—’

Rees snorted. ‘Hollerbach, you’re turning into a maundering bugger in your old age.’

Hollerbach raised his eyebrows. ‘Boy, I was cultivating old age while you were still chewing iron ore on the kernel of a star.’

‘Well, I don’t know about the far future, and there’s not a damn thing I can do about it. All I can do is solve the problems of the present. And frankly, Hollerbach, I don’t believe we’ve a hope of surviving this trip without your guidance.

‘Gentlemen, we’ve a lot to do. I suggest we get on with it.’

The plate hung over the Raft. Pallis crept to its edge and peered out over the battered deckscape.

Smoke was spreading across the deck like a mask over a familiar face.

Suddenly the plate jerked through the air, bowling Pallis onto his back. With a growl he reached out and grabbed handfuls of the netting that swathed the fragile craft. ‘By the Bones, innkeeper, can’t you control this bloody thing?’

Jame snorted. ‘This is a real ship. You’re not dangling from one of your wooden toys now, tree-pilot.’

‘Don’t push your luck, mine rat.’ Pallis thumped a fist into the rough iron of the plate. ‘It’s just that this way of flying is - unnatural.’

‘Unnatural?’ Jame laughed. ‘Maybe you’re right. And maybe you people spent too much time lying around in your leafy bowers, while the miners came along to piss all over you.’

‘The war is over, Jame,’ Pallis said easily. He let his shoulders hang loose, rolled his hands into half fists. ‘But perhaps there are one or two loose ends to be tied up.’

The barman’s broad face twisted into a grin of anticipation. ‘I’d like nothing better, tree swinger. Name the time and place, and choice of weapons.’

‘Oh, no weapons.’

‘That will suit me fine—’

‘By the Bones, will you two shut up?’ Nead, the plate’s third occupant, glared over the charts and instruments spread over his lap. ‘We have work to do, if you recall.’

Jame and Pallis exchanged one last stare, then Jame returned his attention to the controls of the craft. Pallis shifted across the little deck until he sat beside Nead. ‘Sorry,’ he said gruffly. ‘How’s it going?’

Nead held a battered sextant to his eye, then tried to compare the reading to entries in a hand-written table. ‘Damn it,’ he said, clearly frustrated. ‘I can’t tell. I just don’t have the expertise, Pallis. Cipse would know. If only—’

‘If only he weren’t long dead, then everything would be fine,’ Pallis said. ‘I know. Just do your best, lad. What do you think?’

Again Nead ran his fingers over the tables. ‘I think it’s taking too long. I’m trying to measure the sideways speed of the Raft against the background stars, and I don’t think it’s moving fast enough.’

Pallis frowned. He lay on his belly and once more surveyed the Raft. The mighty old craft lay spread out below him like a tray of fantastic toys. Suspended over the deck and marked by the occasional plume of steam he could see other plate craft, more observers of this huge dislocation. A wall of smoke climbed up from one side of the Rim - the port side, as he looked down - and, additionally, each of the trees in the central tethered forest had its own smoke cloak. The smoke was having the desired effect - he could see how the trees’ cables leaned consistently to his right as the flying plants sought to escape the shadow of the smoke - and he imagined he could hear the strain of the cables as the Raft was hauled aside. Cable shadows were beginning to lengthen over the deck; the Raft was indeed moving out from under the star which hung poised over it. It was an inspiring sight, one which Pallis in his long life had seen only twice previously; and for such cooperation to be achieved after the turmoil of revolution and war - and at a time when so many of the Raft’s best were occupied with the Bridge project - was, he decided, something to be admired.

In fact, perhaps the need to move the Raft had provided the glue which had held society together this far. Here was a project which would clearly benefit all.

Yes, it was all admirable - but if it was too slow it wouldn’t mean a damn thing. The falling star was still miles overhead, and there was no immediate danger of impact, but if pressure was maintained on the trees for too long the great plants would tire. Not only would they prove unable to drag the Raft anywhere - it was even conceivable that some might fail altogether, threatening the Raft’s security in the air.

Damn it. He hung his head over the lip of the plate, trying to judge where the problem lay. The Rim wall of smoke looked solid enough; the distant stars cast a long shadow over the masked workers who laboured at the base of the cliff of smoke.

Then the problem must be with the tethered trees themselves. There was a pilot, plus assistants, in each tree, and each of them was trying to maintain his own fence of smoke. Those small barriers were probably the most significant factor in influencing the movement of the individual trees. And, even from up here, Pallis could see how ragged and insubstantial some of those barriers were.

He thumped his fist into the deck of the craft. Damn it; the purges of the revolution, and the fevers and starvation that had followed, had left his corps of pilots as depleted of skilled people as most other sectors of Raft society. He remembered Raft translations of the past: the endless calculations, the shift-long briefings, the motion of the trees like components of a fine machine . . .

There had been time for none of that. Some of the newer pilots barely had the skill to keep from falling out of their trees. And building a lateral wall was one of the most difficult of a pilot’s arts; it was like sculpting with smoke . . .

He spotted a group of trees whose barriers were particularly ragged. He pointed them out to Jame.

The barman grinned and yanked at his control cables.

Pallis tried to ignore the gale in his face, the stink of steam; he put aside his nostalgia for the stately grandeur of the trees. Beside him he heard Nead curse as his papers were blown like leaves. The plate swooped among the trees like some huge, unlikely skitter; Pallis couldn’t help but flinch as branches shot past, mere feet from his face. At last the craft came to rest. From here those smoke barriers looked even more tenuous; Pallis watched, despairing, as raw pilots waved blankets at wisps of smoke.

He cupped his hands to his mouth. ‘You!’

Small faces turned up to him. One pilot tumbled backwards.

‘Build up your bowls!’ Pallis called angrily. ‘Get a decent amount of smoke. All you’re doing with those damn blankets is blowing around two fifths of five per cent of bugger all . . .’

The pilots inched their way to their bowls and began feeding fresh kindling to the tiny flames.

Nead tugged at Pallis’s sleeve. ‘Pilot. Should that be happening?’

Pallis looked. Two trees, wrapped in distorted blankets of smoke, were inclining blindly towards one another, their amateur pilots evidently absorbed in the minutiae of blankets and bowls.

‘No, it bloody shouldn’t be happening,’ Pallis spat. ‘Barman! Get us down there, and fast—’

The trees’ first touch was almost tender: a rustle of foliage, a gentle kiss of snapping twigs. Then the first snag occurred, and the two platforms locked and shuddered. The crews of the trees gaped with sudden horror at each other.

The trees kept turning; now sections of rim were torn away and wooden shards rained through the air. A branch caught and with a scream was torn away by the root. Now the trees began to roll into each other, in a vast, slow, noisy collision. The smooth platforms of foliage shattered. Fist-sized splinters sailed past the plate craft; Nead howled and covered his head.

Pallis glared down at the crews of the dying trees. ‘Get off there! The damn trees are finished. Get down your cables and save yourselves.’

They stared up at him, frightened and confused. Pallis shouted on until at last he saw them slide down rippling cables to the deck.

The trees were now locked in a doomed embrace, their angular momenta mingling, their trunks orbiting in a whirl of foliage and branch stumps. Wall-sized sections of wood splintered away and the air was filled with the creak of rending timber; Pallis saw fire bowls go sailing through the air, and he prayed that the crews had had the foresight to douse their flames.

Soon little was left but the trunks, locked together by a tangle of twisted branches; now the trees’ anchoring cables were torn loose like shoulders from sockets, and the freed trunks pirouetted with a strange grace, half tumbling.

At last the trunks crashed to the deck, exploding in a storm of fragments. Pallis saw men running for their lives from the rain of wood. For some minutes splinters fell, like a hail of ragged daggers; then, slowly, men began to creep back to the crash site, stepping over tree cables which lay like the limbs of a corpse among the ruins.

Silently Pallis motioned to Jame. ‘There’s nothing we can do here; let’s get on.’ The plate craft lifted and returned to its patrols.

For several more hours Pallis’s plate skimmed about the flying forest. At the end of it Jame was muttering angrily, his face blackened by the rising smoke, and Pallis’s throat was raw with shouting. At last Nead placed his sextant in his lap and sat back with a smile. ‘That’s it,’ he said. ‘I think, anyway . . .’

‘What’s what?’ Jame growled. ‘Is the Raft out from under the bloody star now?’

‘No, not yet. But it’s got enough momentum without further impulse from the trees. In a few hours it will drift to a halt far enough from the path of the star to be safe.’

Pallis lay back in the netting of the plate and took a draught from a drink globe. ‘So we’ve made it.’

Nead said dreamily, ‘It’s not quite over for the Raft yet. When the star passes through the plane in which the Raft lies there will be a few interesting tidal effects.’

Pallis shrugged. ‘Nothing the Raft hasn’t endured before.’

‘It must be a fantastic sight, Pallis.’

‘Yes, it is,’ the pilot mused. He remembered watching cable shadows lengthen across the deck; at last the circumference of the star disc would touch the horizon, sending light flaring across the deck. And when the main disc had dropped below the Rim there would be an afterglow, what the Scientists called a corona . . .

Jame squinted into the sky. ‘How often does this happen, then? How often does the Raft get in the way of a falling star?’

Pallis shrugged. ‘Not often. Once or twice a generation. Often enough for us to have built up skills to deal with it.’

‘But you need the Scientists - the likes of this one—’ Jame jerked a thumb at Nead ‘—to work out what to do.’

‘Well, of course.’ Nead sounded amused. ‘You can’t do these things by sticking a wet finger into the wind.’

‘But a lot of the Scientists are going to bugger off, on this Bridge thing.’

‘That’s true.’

‘So what’s going to happen when the next star comes down? How will they move the Raft then?’

Nead sipped a drink easily. ‘Well, our observations show that the next star - a long way up there—’ he pointed upwards ‘- is many thousands of shifts away from endangering the Raft.’

Pallis frowned. ‘That doesn’t answer Jame’s question.’

‘Yes, it does.’ Nead’s blank young face bore a look of puzzlement. ‘You see, by that time we don’t expect the Nebula to be sustaining life anyway. So the problem’s rather academic, isn’t it?’

Pallis and Jame exchanged glances; then Pallis turned to the rotating forest under his craft and tried to lose himself in contemplation of its steady serenity.

Rees hardly slept during his last rest period before the Bridge’s departure.

A bell tolled somewhere.

At last it was time. Rees rose from his pallet, washed quickly, and emerged from his temporary shelter, feeling only a vast relief that the time had come.

The Bridge in its box of scaffolding was the centre of frantic activity. It lay at the heart of a fenced-off area two hundred yards wide which had become a miniature city; former Officers’ quarters had been commandeered to give hopeful migrants temporary accommodation. Now small knots of people walked uncertainly towards the Bridge. Rees recognized representatives of all the Nebula’s cultures: the Raft itself, the Belt, and even a few Boneys. Each refugee carried the few pounds of personal belongings allowed. A queue was forming at the open port of the Bridge, behind a human chain which passed into the interior a few final supplies, books, small environmental monitoring instruments. There was an air of purposefulness about the scene and Rees slowly began to believe that this thing was actually going to happen . . .

Whatever the future held he could only be glad that this period of waiting, with all its divisiveness and bitterness, was over. After the moving

of the Raft, society had disintegrated rapidly. It had been a race to complete their preparations before things fell apart completely; and as time had passed - and more delays and problems had been encountered - Rees had felt the pressure build until it seemed he could hardly bear it.

The amount of personal animosity he had encountered had astonished him. He longed to explain to people that it was not he who was causing the Nebula to fail; that it was not he who decreed the physical laws which constrained the number of evacuees.

. . . And it had not been he - alone - who had drawn up the list.

The preparation of that list had been agonizing. The idea of a ballot had been rejected quickly; the composition of this colony could not be left to chance. But how to select humans - families, chains of descendants - for life or extinction? They had tried to be scientific, and so had applied criteria like physical fitness, intelligence, adaptability, breeding age . . . And Rees, embarrassed and disgusted by the whole process, had found himself on most of the candidate lists.

But he had stayed with it; not, he prayed, merely in order to ensure his own survival, but to do the best job he could. The selection process had left him feeling soiled and shabby, unsure even of his own motivations.

In the end a final list had emerged, an amalgam of dozens of others drawn together by Decker’s harsh arbitration. Rees was on it. Roch wasn’t. And so, Rees reflected with a fresh burst of self-loathing, he had finished by neatly fulfilling the worst expectations of Roch and his like.

He walked to the perimeter fence. Perhaps he would see Pallis, get a last chance to say goodbye. Burly guards patrolled, hefting clubs uncertainly. Rees felt depressed as he stared along the length of the fence. Yet more resources diverted from the main objective . . . but there had been riots already; who was to say what might have happened if not for the protection of the fence and its guards? A guard caught his eye and nodded, his broad face impassive; Rees wondered how easy it would be for this man to fight off his own people in order to save a privileged few . . .

An explosion somewhere on the other side of the Bridge, like a massive heel stamping into the deck. A pall of smoke rose over the scaffolding.

The guards near Rees turned to stare. Rees hurried around the Bridge.

Distant shouts, a scream . . . and the fence was down and burning along ten feet of its length. Guards ran to the breach, but the mob beyond seemed

overwhelming, both in numbers and in ferocity; Rees saw a wall of faces, old and young, male and female, united by a desperate, vicious anger. Now fire bombs rained towards the Bridge, splashing over the deck.

‘What the hell are you doing here?’ It was Decker; the big man took Rees’s arm and pulled him back towards the Bridge.

‘Decker, can’t they understand? They can’t be saved; there simply isn’t room. If they attack now the mission will fail and nobody will—’

‘Lad.’ Decker took his shoulders and shook him, hard. ‘The time for talk is over. We can’t hold off that lot for long . . . You have to get in there and launch. Right now.’

Rees shook his head. ‘That’s impossible.’

‘I’ll show you what’s bloody impossible.’ A small fire burned amid the ruins of a firebomb; Decker bent, lit a chunk of scrap wood, and hurled it into the scaffolding surrounding the Bridge. Soon flames were licking at the dry wood.

Rees stared. ‘Decker—’

‘No more discussion, damn you!’ Decker roared into his face, spittle spraying. ‘Take what you can and get out of here—’

Rees turned to run.

He looked back once. Decker was already lost in the mêlée at the breach.

Rees reached the port. The orderly queue of a few minutes earlier had disintegrated; people were trying to force their way through the doorway, screaming and holding their absurd packages of luggage above their heads. Rees used his fists and elbows to fight his way through to the interior. The Observatory was a cage of noisy chaos, with equipment and people jumbled and crushed together; the single remaining large instrument - the Telescope - loomed over the crowd like some aloof robot.

Rees rammed his way through the crowd until he found Gord and Nead. He pulled them close. ‘We launch in five minutes!’

‘Rees, that’s impossible,’ Gord said. ‘You can see the state of things. We’d cause injury, death even, to the passengers and those outside—’

Rees pointed to the transparent hull. ‘Look out there. See that smoke? Decker has fired the damn scaffolding. So your precious explosive bolts are going to blow in five minutes anyway. Right?’

Gord paled.

Suddenly the noise outside grew to a roar; Rees saw that more sections of the fence were failing. The few guards still fighting were being overwhelmed by a wave of humanity.

‘When they reach us we’re finished,’ Rees said. ‘We have to launch. Not in five minutes. Now.’

Nead shook his head. ‘Rees, there are still people—’

‘Close the damn door!’ Rees grabbed the young man’s shoulder and shoved him towards a wall-mounted control panel. ‘Gord, fire those bolts. Just do it—’

His eyes narrow, his cheeks trembling with fear, the little engineer disappeared into the crush.

Rees forced his way to the Telescope. He clambered up the old instrument’s mount until he was looking down over a confused sea of people. ‘Listen to me!’ he bellowed. ‘You can see what’s happening outside. We have to launch. Lie down if you can. Help your neighbours; watch the children—’

Now fists were battering against the hull, desperate faces pressing to the clear wall—

—and, with a synchronized crackle, the scaffolding’s explosive bolts ignited. The fragile wooden frame disintegrated rapidly; now nothing held the Bridge to the Raft.

The floor dipped. Screams rose like flames; the passengers clung to each other. Beyond the clear hull the Raft deck rose around the Bridge like a liquid, and the Raft’s gravitational field hauled the passengers into the air, bumping them almost comically against the roof.

A crescendo of cries came from the doorway. Nead had failed to close the port in time; stragglers were leaping across the widening chasm between Bridge and deck. A last man clattered through the closing door; his ankle was trapped in the jamb and Rees heard the shin snap with sickening suddenness. Now a whole family tumbled off the Raft deck and impacted against the hull, sliding into infinity with looks of surprise . . .

Rees closed his eyes and clung to the Telescope.

At last it was over. The Raft turned into a ceiling above them, distant and abstract; the thin rain of humans against the hull ceased, and four hundred people had suddenly entered free fall for the first time in their lives.

There was a yell, as if from very far away. Rees looked up. Roch, burning club in hand, had leapt through the hole in the heart of the Raft. He fell through the intervening yards spreadeagled; he stared, eyes bulging, in through the glass at horrified passengers.

The huge miner smashed face-down into the clear roof of the Observatory. He dropped his club and scrabbled for a handhold against the slick wall; but helplessly he slid over the surface, leaving a trail of blood from his crushed nose and mouth. Finally he tumbled over the side - then, at the last second, he grabbed at the rough protrusion of a steam jet.

Rees climbed down from the Telescope and found Gord. ‘Damn it, we have to do something. He’ll pull that jet free.’

Gord scratched his chin and studied the dangling miner, who glared in at the bemused passengers. ‘We could fire the jet. The steam would miss him, of course, since he’s hanging beneath the orifice itself - but his hands would burn - yes; that would shake him loose . . .’

‘Or,’ Rees said, ‘we could save him.’

‘What? Rees, that joker tried to kill you.’

‘I know.’ Rees stared out at Roch’s crimson face, his straining muscles. ‘Find a length of rope. I’m going to open the door.’

‘You’re not serious . . .’

But Rees was already heading for the port.

When at last the huge miner lay exhausted on the deck, Rees bent over him. ‘Listen to me,’ he said steadily. ‘I could have let you die.’

Roch licked blood from his ruined mouth.

‘I saved you for one reason,’ Rees said. ‘You’re a survivor. That’s what drove you to risk your life in that crazy leap. And where we’re going we need survivors. Do you understand? But if I ever - even once - think that you’re endangering this mission with your damn stupidity I’ll open that door and let you finish your fall.’

He held the miner’s eyes for long minutes; at last, Roch nodded.

‘Good.’ Rees stood. ‘Now then,’ he said to Gord, ‘what first?’

There was a stink of vomit in the air.

Gord raised his eyebrows. ‘Weightlessness education, I think,’ he said. ‘And a lot of work with mops and buckets . . .’

His hands around his assailant’s throat and weapon arm, Decker turned to see the Bridge scaffolding collapse into its flimsy components. The great

cylinder hung in the air, just for a second; then the steam jets spurted white clouds and the Bridge fell away, leaving a pit in the deck into which people tumbled helplessly.

So it was over; and Decker was stranded. He turned his attention back to his opponent and began to squeeze away the man's life.

On the abandoned Raft the killing went on for many hours.

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15

The crowded ship's first few hours after the fall were nearly unbearable. The air stank of vomit and urine, and people of all ages swarmed about the chamber, scrambling, shrieking and fighting.

Rees suspected that the problem was not merely weightlessness, but also the abrupt reality of the fall itself. Suddenly to face the truth that the world wasn't an infinite disc after all - to know that the Raft really had been no more than a mote of patched iron floating in the air - seemed to have driven some of the passengers to the brink of their sanity.

Maybe it would have been an idea to keep the windows opaqued during the launch.

Rees spent long hours supervising the construction of a webbing of ropes and cables crisscrossing the Observatory. 'We'll fill the interior with this isotropic structure,' Hollerbach had advised gravely. 'Make it look the same in every direction. Then it won't be quite so disconcerting when we reach the Core and the whole bloody universe turns upside down . . .'

Soon the passengers were draping blankets over the ropes, fencing off small volumes for privacy. The high-technology interior of the Bridge began to take on a homely aspect as the makeshift shanty town spread; human smells, of food and children, filled the air.

Taking a break, Rees made his way out of the crushed interior to what had formerly been the roof of the Observatory. The hull was still transparent. Rees pressed his face to the warm material and peered out, irresistibly reminded of how he had once peered out of the belly of a whale.

After the fall from the Raft the Bridge had rapidly picked up speed and reoriented itself so that its stubby nose was pointing at the heart of the Nebula. Now it hurtled down through the air, and the Nebula had turned into a vast, three-dimensional demonstration of perspective motion. Nearby clouds shot past, middle distance stars glided towards space - and even at the limits of vision, many hundreds of miles away, pale stars slowly drifted upwards.

The Raft had long since become a mote lost in the pink infinity above.

The hull shuddered briefly. A soundless plume of steam erupted a few yards above Rees's head and was instantly whipped away, a sign that Gord's ramshackle attitude control system was doing its job.

The hull felt warmer than usual against his face. The wind speed out there must be phenomenal, but the virtually frictionless material of the Bridge was allowing the air to slide harmlessly past with barely a rise in temperature. Rees's tired mind ambled down speculative alleyways. If you measured the temperature rise, he reasoned, you could probably get some kind of estimate of the hull's coefficient of friction. But, of course, you would also need some data on the material's heat conduction properties—

'It's astonishing, isn't it?'

Nead was at his side. The younger man cradled a sextant in his arms. Rees smiled. 'What are you doing here?'

'I'm supposed to be measuring our velocity.'

'And?'

'We're at terminal velocity for the strength of gravity out here. I estimate we will reach the Core in about ten shifts . . .'

Nead delivered his words dreamily, his attention taken up by the view; but they had an electric effect on Rees. Ten shifts . . . in just ten shifts he would stare at the face of the Core, and the destiny of the race would be made or lost.

He pulled himself back to the present. 'We never did get to finish your training, did we, Nead?'

'Other events were more pressing,' Nead said dryly.

'Let's find a home where we will always have time to train people properly . . . time, even, to stare out of the window—'

Jaen started talking even before she reached them. '. . . And if you don't tell this insufferable old buffoon that he's left his sense of priorities back on the Raft, then I won't be responsible for my actions, Rees!'

Rees groaned inwardly. Evidently his break was over. He turned; Jaen bore down on him with Hollerbach following, hauling himself cautiously through the network of ropes. The old Scientist muttered, 'I don't believe I've been spoken to like that by a mere Second Class since - since—'

Rees held his hands up. 'Slow down, you two. Start from the top, Jaen. What's the problem?'

'The problem,' Jaen spat, jerking her thumb, 'is this silly old fart, who —'

'Why, you impudent—'

'Shut up!' Rees snapped.

Jaen, simmering, made a visible effort to calm down. ‘Rees. Am I or am I not in charge of the Telescope?’

‘That’s my understanding.’

‘And my brief is to make sure that the Navigators - and their Boney so-called assistants - get all the data they need to guide our trajectory around the Core. And that has to be our number one priority. Right?’

Rees rubbed his nose doubtfully. ‘I can’t argue with that . . .’

‘Then tell Hollerbach to keep his damn hands off my equipment!’

Rees turned to Hollerbach, suppressing a smile. ‘What are you up to, Chief Scientist?’

‘Rees . . .’ The old man wrapped his long fmgers together, pulling at the loose flesh. ‘We have left ourselves with only one significant scientific instrument. Now, I’ve no wish to revisit the arguments behind the loading of this ship. Of course the size of the gene pool must come first . . .’ He thumped one fist into his palm. ‘Nevertheless it is at precisely this moment of blindness that we are approaching the greatest scientific mystery of this cosmos: the Core itself—’

‘He wants to turn the Telescope on the Core,’ Jaen said. ‘Can you believe it?’

‘The understanding to be acquired by even a superficial study is incalculable.’

‘Hollerbach, if we don’t use that damn telescope to navigate with we might get a closer look at the Core than any of us have bargained for!’ Jaen glared at Rees. ‘Well?’

‘Well what?’

Hollerbach looked sadly at Rees. ‘Alas, lad, I suspect this little local difficulty is only the first impossible arbitration you will be called on to make.’

Rees felt confused, isolated. ‘But why me?’

Jaen snapped, ‘Because Decker is still on the Raft. And who else is there?’

‘Who indeed?’ Hollerbach murmured. ‘I’m sorry, Rees; I don’t think you have very much choice . . .’

‘Anyway, what about this bloody Telescope?’

Rees tried to focus. ‘All right. Look, Hollerbach, I have to agree that Jaen’s work is a priority right now—’

Jaen whooped and punched the air.

‘So your studies must fit in around that work. All right? But,’ he went on rapidly, ‘when we get close enough to the Core the steam jets will become ineffectual anyway. So navigation will become a waste of time . . . and the Telescope can be released, and Hollerbach can do his work. Maybe Jaen will even help.’ He puffed out his cheeks. ‘How’s that for a compromise?’

Jaen grinned and punched him on the shoulder. ‘We’ll make a Committee member of you yet.’ She turned and pulled her way back into the interior of the chamber.

Rees felt his shoulders slump. ‘Hollerbach, I’m too young to be a Captain. And I’ve no desire for the job.’

Hollerbach smiled gently. ‘That last alone probably qualifies you as well as anyone. Rees, I fear you must face it; you’re the only man on board with first-hand experience of the Belt, the Raft, the Bone world . . . and so you’re the only leader figure remotely acceptable to all the ship’s disparate factions. And after all it has been your drive, your determination, that has brought us so far. Now you’re stuck with this responsibility, I fear.

‘And there are some hard decisions ahead. Assuming we round the Core successfully we will face rationing, extremes of temperature in the unknown regions outside the Nebula - even boredom will be a life-threatening hazard! You will have to keep us functioning in extraordinary circumstances. If I can assist you in any way, of course, I will.’

‘Thanks. I don’t much like the idea, but I guess you are right. And to help me you could start,’ he said sharply, ‘by sorting out your differences with Jaen yourself.’

Hollerbach smiled ruefully. ‘That young woman is rather forceful.’

‘Hollerbach, what do you expect to see down there anyway? I guess a close view of a black hole is going to be spectacular enough . . .’

A flush of animation touched Hollerbach’s papery cheeks. ‘Far more than that. Have I ever discussed with you my ideas on gravitic chemistry? I have?’ Hollerbach looked disappointed at the curtailing of his lecture, but Rees encouraged him to continue; for a few minutes, he realized gratefully, he could return to his apprenticeship, when Hollerbach and the rest would lecture him each shift on the mysteries of the many universes.

‘You will recall my speculation on a new type of “atom”,’ Hollerbach began. ‘Its component particles - perhaps singularities themselves - will be bonded by gravity rather than the other fundamental forces. Given the right conditions, the right temperature and pressure, the right gravitational gradients, a new “gravitic chemistry” will be possible.’

‘In the Core,’ Rees said.

‘Yes!’ Hollerbach declared. ‘As we skirt the Core we will observe a new realm, my friend, a new phase of creation in which—’

Over Hollerbach’s shoulder there loomed a wide, bloodstained face. Rees frowned. ‘What do you want, Roch?’

The huge miner grinned. ‘I only wanted to point out what you’re missing. Look.’ He pointed.

Rees turned. At first he could see nothing unusual - and then, squinting, he made out a faint patch of dull brown amid the upward shower of stars. It was too far away to make out any detail, but memory supplied the rest; and he saw again a surface of skin stretched over bone, white faces turning to a distant speck in the air—

‘The Boneys,’ he said.

Roch opened his corrupt mouth and laughed; Hollerbach flinched, disgusted. ‘Your home from home, Rees,’ Roch said coarsely. ‘Don’t you feel like dropping in and visiting old friends?’

‘Roch, get back to your work.’

Roch did so, still laughing.

Rees stayed for some minutes at the hull, watching until the Boneys’ worldlet was lost in the haze far above. Yet another piece of his life gone, beyond recall . . .

With a shudder he turned from the window and, with Hollerbach, immersed himself once more in the bustle and warmth of the Bridge.

Almost powerless, its soft human cargo swarming through its interior, the battered old ship plunged towards the black hole.

The sky outside darkened and filled up with the fantastic, twisted star sculptures observed by Rees on his first journey to these depths. The Scientists left the hull transparent; Rees gambled that this would distract the helpless passengers from their steadily worsening plight. And so it turned out; as the shifts passed a growing number spent time at the great windows, and the mood of the ship became one of calm, almost of awe.

Now, with closest approach to the Core barely a shift away, the Bridge was approaching a school of whales; and the windows were coated with human faces. Rees discreetly made room for Hollerbach; side by side they stared out.

At this depth each whale was a slender missile, its deflated flesh an aerodynamic casing around its internal organs. Even the great eyes had closed now, so that the whales plummeted blind into the Core - and there were row upon row of them, above, below and all around the Bridge, so many that at infinity the air was a wall of pale flesh.

Rees murmured, ‘If I’d known it would be as spectacular as this I wouldn’t have got off last time.’

‘You’d never have survived,’ Hollerbach said. ‘Look closely.’ He pointed at the nearest whale. ‘See how it glows?’

Rees made out a pinkish glow around the whale’s leading end. ‘Air resistance?’

‘Obviously,’ Hollerbach said impatiently. ‘The atmosphere is like soup at these depths. Now, keep watching.’

Rees kept his eyes fixed on the whale’s nose - and was rewarded with the sight of a six-foot patch of whale skin flaring into flame and tumbling away from the speeding animal. Rees looked around the school with new eyes; throughout the hail of motion he could see similar tiny flares of burning flesh, sparks of discarded fire. ‘It looks as if the whales are disintegrating, as if air resistance is too great . . . Perhaps they have misjudged their path around the Core; maybe our presence has disturbed them—’

Hollerbach snorted in disgust. ‘Sentimental tosh. Rees, those whales know what they’re doing far better than we do.’

‘Then why the burning?’

‘I’m surprised at you, boy; you should have worked it out as soon as you climbed aboard that whale and studied its spongy outer flesh.’

‘At the time I was more interested in finding out whether I could eat it,’ Rees said dryly. ‘But . . .’ He thought it through. ‘You’re saying the purpose of the outer flesh is ablation?’

‘Precisely. The outer layer burns up and falls away. One of the simplest but most efficient ways of dispersing the heat generated by excessive air

resistance . . . a method used on man's earliest spacecraft, as I recall from the Ship's records - records which are, of course, now lost forever—'

Suddenly fire blazed over the hull's exterior; the watching passengers recoiled from a sheet of flame mere inches from their faces.

As soon as it had begun it was over.

'Well, that was no planned ablation,' Rees said grimly. 'That was one of our steam jets. So much for our attitude control.'

'Ah.' Hollerbach nodded slowly, his brow furrowed. 'That's rather earlier than I expected. I had entertained hopes of retaining some control even at closest approach - when, of course, the ship's trajectory may most easily be modified.'

'I'm afraid we're stuck with what we've got, from this point in. We're flying without smoke, as Pallis might say . . . We just have to hope we're on an acceptable course. Come on; let's talk to the navigators. But keep your voice down. Whatever the verdict there's no point in starting a panic.'

The members of the navigation team responded to Rees's questions according to their inclinations. Raft Scientists pored over diagrams which showed orbits sprouting from the Core like unruly hair, while the Boneys threw bits of shaped metal into the air and watched how they drifted.

After some minutes of this, Rees snapped, 'Well?'

Quid turned to him and shrugged cheerfully. 'We're still too far out. Who knows? We'll have to wait and see.'

Jaen scratched her head, a pen tucked behind her ear. 'Rees, we're in an almost chaotic situation here. Because of the distance at which we lost control, our final trajectory remains indeterminately sensitive to initial conditions . . .'

'In other words,' Rees said, irritated, 'we have to wait and see. Terrific.'

Jaen made to protest, then thought better of it.

Quid slapped his shoulder. 'Look, there's not a bloody thing we can do. You've done your best . . . and if nothing else you've given old Quid a damn interesting ride.'

Hollerbach said briskly, 'And you're not alone in those sentiments, my Boney friend. Jaen! I presume your use of the Telescope is now at an end?'

Jaen grinned.

It took thirty minutes to adjust the instrument's orientation and focus. At last Rees, Jaen, Hollerbach and Nead crowded around the small monitor

plate.

At first Rees was disappointed; the screen filled with the thick black cloud of star debris which surrounded the Core itself, images familiar from observations from the Raft. But as the minutes passed and the Bridge entered the outermost layers of the material, the sombre cloud parted before them and the debris began to show a depth and structure. A pale, pinkish light shone upwards at them. Soon veils of shattered star stuff were arching over the hull, making the Bridge seem a fragile container indeed.

Then, abruptly, the clouds cleared; and they were sailing over the Core itself.

Jaen breathed, ‘It’s . . . it’s like a planet . . .’

The Core was a compact mass clustered about its black hole, a flattened sphere fifty miles wide. And, indeed, it was a world rendered in shades of red and pink. Its surface layers - subjected, Rees estimated, to many hundreds of gravities - were well-defined and showed almost topographical features. There were oceans of some quasi-liquid material, thick and red as blood; they lapped at lands that thrust above the general spherical surface. There were even small mountain ranges, like wrinkles in the skin of a soured fruit, and clouds like smoke which sped across the face of the seas. There was continual motion: waves miles wide crisscrossed the seas, the mountain sheets seemed to evolve endlessly, and even the coasts of the strange continents writhed. It was as if some great heat source were causing the Core’s epidermis to wrinkle and blister constantly.

It was like Earth taken to Hell, Rees thought.

Hollerbach was ecstatic. He peered into the monitor as if he wished he could climb through it. ‘Gravitic chemistry!’ he croaked. ‘I am vindicated. The structure of that fantastic surface can be maintained solely by the influence of gravitic chemistry; only gravitic bonds could battle against the attraction of the black hole.’

‘But it all changes so rapidly,’ Rees said. ‘Metamorphoses on a scale of miles, happening in seconds.’

Hollerbach nodded eagerly. ‘Such speed will be a characteristic of the gravitic realm. Remember that changing gravity fields propagate at the speed of light, and—’

Jaen cried out, pointing at the monitor plate.

At the centre of one of the amorphous continents, etched into the surface like a mile-wide chessboard, was a rectangular grid of pink-white light.

Ideas crowded into Rees's mind. 'Life,' he whispered.

'And intelligence,' Hollerbach said. 'Two staggering discoveries in a single glance . . .'

Jaen asked, 'But how is this possible?'

'We should rather ask, "why should it not be so?"' Hollerbach said. 'The essential condition for life is the existence of sharp energy gradients . . . The gravitic realm is one of fast-evolving patterns; the universal principles of self-organization, like the Feigenbaum series which govern the blossoming of structure out of chaos, almost demand that organization should arise.'

Now they saw more gridworks. Some covered whole continents and seemed to be trying to buttress the 'land' against the huge waves. Road-like lines of light arrowed around the globe. And - at the highest magnification - Rees was even able to make out individual structures: pyramids, tetrahedra and cubes.

'And why should intelligence not arise?' Hollerbach went on dreamily. 'On a world of such violent change, selection in favour of organizing principles would be a powerful factor. Look how the gravitic peoples are struggling to preserve their ordered environments against the depredations of chaos!'

Hollerbach fell silent, but Rees's mind raced on. Perhaps these creatures would build ships of their own which could travel to other hole-based 'planets', and meet with their unimaginable cousins. At present this strange biosphere was fuelled by the influx of material from the Nebular debris cloud - a steady rain of star wrecks arcing on hyperbolic trajectories into the Core - and from within by the X-radiating accretion disc around the black hole, deep within the Core itself; but eventually the Nebula would be depleted and the gravitic world would be exposed, naked to space, fuelled only by the heat of the Core and, ultimately, the slow evaporation of the black hole itself.

Long after all the nebulae had expired, he realized, the gravitic people would walk their roiling worlds. With a sense of dislocation he realized that

these creatures were the true denizens of this cosmos; humans, soft, dirty and flabby, were mere transient interlopers.

Closest approach neared.

The Core world turned into a landscape; passengers screamed or sighed as the Bridge soared mere tens of miles above a boiling ocean. Whales drifted over the seas, pale and imperturbable as ghosts.

Something was tugging at Rees's feet. Irritated, he grabbed a Telescope strut and hauled himself back to the monitor; but the pull increased remorselessly, at last growing uncomfortable . . .

He began to worry. The Bridge should be in virtual free fall. Was something impeding it? He peered around the transparent hull, half-expecting - what? That the Bridge had run into some glutinous cloud, some impossible spout from the strange seas below?

But there was nothing.

He returned his attention to the Telescope - to find that Hollerbach was now upside down; arms outstretched he clung to the monitor and was gamely trying to haul his face level with the picture in the plate. Bizarrely, he and Rees seemed to be being pulled towards opposite ends of the ship. Nead and Jaen were similarly arrayed around the Telescope mount, clinging on in the presence of this strange new field.

Screams arose around the chamber. The flimsy structure of ropes and sheets began to collapse; clothes, cutlery, people went sliding towards the walls.

'What the hell's happening, Hollerbach?'

The old Scientist clenched and unclenched his hands. 'Damn it, this isn't helping my arthritis—'

'Hollerbach . . . !'

'It's the tide!' Hollerbach snapped. 'By the Bones, boy, didn't you learn anything in my orbital dynamics classes? We're so close to the Core that its gravity field is varying significantly on a scale of a few yards.'

'Damn it, Hollerbach, if you knew all about this why didn't you warn us?' Hollerbach refused to look abashed. 'Because it was obvious, boy . . . ! And any minute now we'll get the really spectacular stuff. As soon as the gravitational gradient exceeds the moment imposed by air friction - ah, here we go . . .'

The image in the monitor blurred as the Telescope lost its lock. The churning ocean wheeled over Rees's head. Now the shanty construction collapsed completely and bewildered passengers were hurled about; spatters of blood appeared on flesh, clothes, walls.

The ship was turning.

'Nose down!' Hollerbach, hands still clamped to the Telescope, screamed to make himself heard. 'The ship will come to equilibrium nose down to the Core—'

The prow of the ship swung to the Core, ran past it, hauled itself back, as if the Bridge were a huge magnetized needle close to a lump of iron. With each swing the devastation within the chamber worsened; now Rees could see limp bodies among the thrashing passengers. Absurdly, he was reminded of the dance he had watched in the Theatre of Light; like dancers, Bridge and Core were going through an aerial ballet, with the ship waltzing in the black hole's arms of gravity.

At last the ship stabilized, its axis pointing at the Core. The passengers and their effects had been wadded into the ends of the cylindrical chamber, where the tidal effects were most strong; Rees and the other Scientists, still clinging to the Telescope mount, were close to the ship's centre of gravity, and were, Rees realized, escaping comparatively lightly.

Blood-red oceans swept past the windows.

'We must be near closest approach,' Rees shouted. 'If we can just survive the next few minutes, if the ship holds together against this tide—'

Nead, arms twined around the shaft of the Telescope, was staring at the Core ocean. 'I think we might have to survive more than that,' he said.

'What?'

'Look!' Nead pointed - and, his grip loosened, he slipped away from the Telescope. He scrabbled against the sheer surface of the instrument, hands trying to regain their purchase; then his grasp failed completely. Still staring at the window he fell thirty yards into the squirming mass of humanity crushed into one end of the cylindrical chamber.

He hit with a cracking sound, a cry of pain. Rees closed his eyes.

Hollerbach shouted urgently, 'Rees. Look at what he was telling us.'

Rees turned.

The sea of blood continued to churn; but now, Rees saw, there was a distinct whirlpool, a tight knot gathered beneath the Bridge. Shadows

moved in that maelstrom, vast and purposeful. And - the whirlpool was moving with the hurtling ship, tracking its progress . . .

The whirlpool burst like a blister and a disc a hundred yards wide came looming out of the ocean. Its jet black surface thrashed; with bewildering frequency vast limbs pulsed out, as if fists were straining through a sheet of rubber. The disc hovered for long seconds; then, its rotation slowing, it fell back into the pounding ocean.

Almost immediately the whirlpool began to collect once more.

The old Scientist's face was grey. 'That's the second such eruption. Evidently not all the life here is as civilized as us.'

'It's alive? But what does it want?'

'Damn it, boy, think for yourself!'

At the heart of this gale of noise Rees tried to concentrate. 'How does it sense us? Compared to gravitic creatures we are things of gossamer, barely substantial. Why should it be interested in us . . .?'

'The supply machines!' Jaen shouted.

'What?'

'They're powered by mini black holes . . . gravitic material. Perhaps that's all the gravitic creature can see, as if we're a ship of ghosts surrounding crumbs of . . .'

'Of food,' Hollerbach finished wearily.

Again the creature roared up from its ocean, scattering whales like leaves. This time a limb, a cable as thick as Rees's waist, came close enough to make the ship shudder in its flight. Rees made out detail on the creature's surface; it was like a sculpture rendered in black on black. Tiny forms - independent animals, like parasites? - raced with eye-bewildering speed across the pulsing surface, colliding, melding, rebounding.

Again the disc fell away, colliding with its spawning sea with a fantastic, slow-motion splash; and again the whirlpool began to gather.

'Hunger, Hollerbach said. 'The universal imperative. The damn thing will keep trying until it swallows us whole. And there's nothing we can do about it.' He closed his rheumy eyes.

'We're not dead yet,' Rees muttered. 'If baby wants feeding, we'll feed baby.' An angry determination flooded his thoughts. He hadn't come so far, achieved so much, merely to see it brushed aside by some nameless horror . . . even if its very atoms were composed of black holes.

He scanned the chamber, The rope network had collapsed, leaving the interior of the chamber scoured clear of people; but some ropes still clung where they had been fixed to the walls and ceilings. One such led from the Telescope mount directly to the exit to the Bridge's corridor. Rees eyed its track. It lay almost exclusively within feet of the ship's waist, so that when he followed it he could stay close to the weightless zone.

Cautiously, one hand at a time, he loosened his grip on the Telescope mount. As the rope took his mass he drifted slowly towards one end of the chamber . . . but too slowly to matter. Rapidly he worked his way hand over hand along the rope.

With the port only feet away the rope came loose of its mountings and began to snake through the air.

He scrambled over the wall surface with the palms of his hands and lunged at the port. When he had reached its solid security he paused for a few breaths, hands and feet aching.

Once more the animal erupted from its ocean; once more its wriggling face loomed over the Bridge.

Rees shouted over the moans of the passengers. 'Roch! Roch, can you hear me? Miner Roch . . . !'

At last Roch's broad, battered face thrust out of the mass of crushed humanity at one end of the cylindrical chamber.

'Roch, can you get up here?'

Roch looked about, studying the ropes clinging to the walls. Then he grinned. He stepped over the people around him, pushing heads and limbs deeper into the mêlée; then, with animal grace, he scrambled up the ropes plastered against the great windows. As one rope collapsed and fell away he leapt to another, then another; until at last he had joined Rees at the port. 'See?' he told Rees. 'All that hard work in five gees pays off in the end—'

'Roch, I need your help. Listen to me—'

One of the food machines had been mounted just inside the Bridge's port, and Rees found himself giving thanks for the fortuitous narrowness of the Bridge's access paths. A little more room and the thing would have been taken down to one of the Bridge's end chambers - and Rees doubted even Roch's ability to raise tons through the multiple-gee climb to the ship's mid point.

The ship shuddered again.

When Rees explained his idea Roch grinned, his eyes wide and demonic - damn it, the man was even enjoying this - and, before Rees could stop him, he slapped a broad palm against the port's control panel.

The port slid aside. The air outside was hot, thick and rushed past at enormous speed; the pressure difference hauled at Rees like an invisible hand, slamming him into the side of the supply machine.

The open port was a three-yard-square slice of chaos, completely filled by the writhing face of the gravitic animal. A tentacle a mile long lashed through the air; Rees felt the Bridge quiver at its approach. One touch of that stuff and the old ship would implode like a crushed skitter—

Roch crawled around the supply machine away from the port, so that he was lodged between the machine and the outer wall of the Observatory.

Rees looked at the base of the machine; it had been fixed to the Bridge's deck with crude, fist-sized iron rivets. 'Damn it,' he shouted over the roar of the wind. 'Roch, help me find tools, something to use as levers . . .'

'No time for that, Raft man.' Roch's voice was strained, as Rees remembered it once sounding as the big man had got to his feet under the five gees of the star kernel. Rees looked up, startled.

Roch had braced his back against the supply machine, his feet against the wall of the Observatory; and he was shoving back against the machine. The muscles of his legs bulged and sweat stood out in beads over his brow and chest.

'Roch, you're crazy! That's impossible . . .'

One of the rivets creaked; shards of rusty iron flew through the turbulent air.

Roch kept his swelling eyes fixed on Rees. The muscles of his neck seemed to bunch around his widening grin, and his tongue protruded, purple, from broken lips.

Now another rivet gave way with a crack like a small explosion.

Belatedly Rees placed his hands on the machine, braced his feet against the angle of floor and wall, and shoved with Roch until the veins of his arms stood out like rope.

Another rivet broke. The machine tilted noticeably. Roch adjusted his position and continued to shove. The miner's face was purple, his bloody eyes fixed on Rees. Small popping sounds came from within that vast body,

and Rees imagined discs and vertebrae cracking and fusing along Roch's spine.

At last, with a series of small explosions, the remaining rivets collapsed and the machine tumbled through the port. Rees fell onto his chest amid the stumps of shattered rivets, his lungs pumping oxygen from the depleted air. He lifted his head. 'Roch . . .?'

The miner was gone.

Rees scrambled up from the deck and grabbed the rim of the port. The gravitic beast covered the sky, a huge, ugly panorama of motion - and suspended before it was the ragged bulk of the supply machine. Roch was spreadeagled against the machine, his back to the battered metal wall. The miner stared across a few feet into Rees's eyes.

Now a cable-like limb lashed out of the animal and swatted at the supply machine. The device was knocked, spinning, towards the writhing black mass. Then the predator folded around its morsel and, apparently satiated, sank back into the dark ocean for the last time.

With the last of his strength Rees palmed closed the port.

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16

As the flight through space wore on, again and again Rees was drawn to the hull's small window space. He pressed his face to the warm wall. He was close to the waist of the Bridge here: to his left the Nebula, the home they had discarded, was a crimson barrier that cut the sky in half; to his right the destination nebula was a bluish patch he could still cover with one hand.

As the ship had soared away from the Core the navigation team had spent long hours with their various sextants, charts and bits of carved bone; but at last they had announced that the Bridge was, after all, on course. There had been a mood of elation among the passengers. Despite the deaths, the injuries, the loss of the food machine, their mission seemed bound for success, its greatest trial behind it. Rees had found himself caught up in the prevailing mood.

But then the Bridge had left behind the familiar warm light of the Nebula.

Most of the hull had been opaqued to shut out the oppressive darkness of the internebular void. Bathed in artificial light, the reconstructed shanty town had become once more a mass of homely warmth and scents, and most of the passengers had been glad to turn inwards and forget the emptiness beyond the ancient walls of the ship.

But despite this the mood of the people grew more subdued - contemplative, even sombre.

And then the loss of one of their two supply machines had started to work through, and rationing had begun to bite.

The sky outside was a rich, deep blue, broken only by the diffuse pallor of distant nebulae. The Scientists had puzzled over their ancient instruments and assured Rees that the internebular spaces were far from airless, although the gases were far too thin to sustain human life. 'It is as if,' Jaen had told him excitedly, 'the nebulae are patches of high density within a far greater cloud, which perhaps has its own internal structure, its own Core. Perhaps all the nebulae are falling like stars into this greater Core.'

'And why stop there?' Rees had grinned. 'The structure could be recursive. Maybe this greater nebula is itself a mere satellite of another,

mightier Core; which in turn is a satellite of another, and so on, without limit.'

Jaen's eyes sparkled. 'I wonder what the inhabitants of those greater Cores would look like, what gravitic chemistry could do under such conditions . . .'

Rees shrugged. 'Maybe one day we'll send up a ship to find out. Travel to the Core of Cores . . . but there may be more subtle ways to probe these questions.'

'Like what?'

'Well, if our new nebula really is falling into a greater Core there should be measurable effects. Tides, perhaps - we could build up hypotheses about the mass and nature of the greater Core without ever seeing it.'

'And knowing that, we could go on to validate whole families of theories about the structure of this universe . . .'

Rees smiled now, something of that surge of intellectual confidence returning briefly to warm him.

But if they couldn't feed themselves all these dreams counted for nothing.

The ship had picked up enormous velocity by its slingshot manoeuvre around the Core, climbing into internebular space within hours. They'd travelled for five shifts since then . . . but there were still twenty shifts to go. Could the ship's fragile social structure last so long?

There was a bony hand on his shoulder. Hollerbach thrust forward his gaunt face and peered through the window. 'Wonderful,' he murmured.

Rees said nothing.

Hollerbach let his hand rest. 'I know what you're feeling.'

'The worst of it is,' Rees said quietly, 'that the passengers still blame me for the difficulties we face. Mothers hold out their hungry children accusingly as I go past.'

Hollerbach laughed. 'Rees, you mustn't let it bother you. You have not lost the brave idealism of your recent youth - the idealism which, untempered by maturity,' he said dryly, 'drove you to endanger your own skin by associating yourself with the Scientists at the time of the rebellion. But you have grown into a man who has learned that the first priority is the survival of the species . . . and you have learned to impose that discipline on others. You showed that with your defeat of Gover.'

‘My murder of him, you mean.’

‘If you felt anything other than remorse for the actions you have been forced to take, I would respect you less.’ The old Scientist squeezed his shoulder.

‘If only I could be sure I have been right,’ Rees said. ‘Maybe I’ve seduced these people to their deaths with false hope.’

‘Well, the signs are good. The navigators assure me our manoeuvre around the Core was successful, and that we are on course for our new home . . . And, if you want a further symbol of good fortune—’ He pointed above his head. ‘Look up there.’

Rees peered upwards. The migrating school of whales was a sheet of slender, ghostly forms crossing the sky from left to right. On the fringes of that river of life he caught glimpses of plate creatures, of sky wolves with firmly closed mouths, and other, even more exotic creatures, all gliding smoothly to their next home.

Throughout the Nebula there must be more of these vast schools: rank on rank of them, all abandoning the dying gas cloud, scattering silhouettes against the Nebula’s sombre glow. Soon, Rees mused, the Nebula would be drained of life . . . save for a few tethered trees, and the trapped remnants of humanity.

Now there was a slow stirring in the whale stream. Three of the great beasts drifted together, flukes turning, until they were moving over and around each other in a vast, stately dance. At last they came so close that their flukes interlocked and their bodies touched; it was as if they had merged into a single creature. The rest of the school drifted respectfully around the triad.

‘What are they doing?’

Hollerbach smiled. ‘Of course I’m speculating - and, at my age, mostly from memory - but I believe they’re mating.’

Rees gasped.

‘Well, why not? What better circumstances to do so, than surrounded by one’s fellows and so far from the stresses and dangers of nebular life? Even the sky wolves are hardly in a position to attack, are they? You know, it wouldn’t surprise me - given these long, enclosed hours with nothing much to do - if we too didn’t enjoy a population explosion.’

Rees laughed. ‘That’s all we need.’

‘Yes, it is,’ Hollerbach murmured seriously. ‘Anyway, my point, my friend, is that perhaps we should emulate those whales. Self-doubt is part of being human . . . but the main thing is to get on with the business of survival, as best one can. And that is what you have done.’ ‘Thanks, Hollerbach,’ Rees said. ‘I understand what you’re trying to do. But maybe you need to tell all that to the passengers’ empty bellies.’ ‘Perhaps. I . . . I —’ Hollerbach collapsed into a bout of deep, rasping coughing.

‘I’m sorry,’ he said at last.

Rees studied the old Scientist with some concern; in the blue internebular light it seemed he saw the lines of Hollerbach’s skull.

The Bridge entered the outermost layers of the new nebula. Thin air whistled around the stumps of the control jets.

Rees and Gord manhandled Nead into the corridor close to the port. The young Scientist’s legs - rendered useless by the smashing of his spine during his fall at closest approach - had been strapped together and stiffened with a length of wood. Nead insisted that he felt nothing below his waist, but Rees saw how his face twisted at each jarring motion.

Studying Nead he felt a deep, sick guilt. The lad was still barely eighteen thousand shifts old, and yet by following Rees he had already been maimed; and now he was volunteering for still more peril. The stumps of snapped rivets at the supply machine’s vacant mount reminded Rees of the sacrifice Roch had made at this place. He was, he found, deeply reluctant to witness another.

‘Listen to me, Nead,’ he said seriously. ‘I appreciate the way you’ve volunteered for this mission—’

Nead looked at him in sudden concern. ‘You have to let me go,’ he insisted.

Rees placed a hand on Nead’s shoulder. ‘Of course. What I’m trying to tell you is that I want to see you fix the new steam jets out there . . . and then return, safely. We need those jets, if we’re not to fall straight into the Core of this new nebula. We don’t need another dead hero.’

‘I understand, Rees.’ Nead smiled. ‘But what can happen? The air out there is desperately thin, but it contains oxygen, and I won’t be out for long.’

‘Take nothing for granted. Remember our sensor instruments were constructed ages ago and in another universe . . . Even if we knew precisely

what they were telling us we wouldn’t know if we could rely on them working here.’

Gord frowned. ‘Yes, but our theories back up the instrument readings. Because of the diffusion of oxygen-based life we expect most of the nebulae to consist of oxygen-nitrogen air.’

‘I know that.’ Rees sighed. ‘And theories are fine. All I’m saying is that we don’t know, here and now, what Nead will find on the other side of that door.’

Nead dropped his eyes. ‘Look, Rees, I know I’m crippled. But my arms and shoulders are as strong as they ever were. I know what I’m doing, and I can do this job.’

‘I know you can . . . Just come back safely.’

Nead smiled and nodded, the characteristic streak of grey in his hair catching the corridor light.

Now Rees and Gord fixed two steam jets to Nead’s waist by a length of rope. The bulky jets were awkward but manageable in the micro-gravity conditions. Another rope was fixed to Nead’s waist and would be anchored to the ship.

Gord checked that the inner door to the Observatory was sealed, so that the passengers were in no danger; then they exchanged final, wordless handshakes, and Gord palmed the opening panel.

The outer door slid out of sight. The air was sucked from Rees’s chest. Sound died to a muffled whisper and he tasted blood running from his nose. A warmth in his popping ears led him to suspect he was bleeding there too.

The door revealed a sea of blue light far below. They had already passed through the nebula’s outer halo of star-spawning hydrogen and it was possible to make out stars above and below them. Far above Rees’s head a small, compact knot of redness marked the position of the Nebula from which he had flown. It was strange to think that he could raise a hand and block out his world, all the places he had seen and the people he had known: Pallis, Sheen, Jame the barman, Decker . . . He knew that Pallis and Sheen had decided to live out their remaining shifts together; now, eyes fixed on that distant blur, Rees sent out a silent prayer that they - and all the others who had sacrificed so much to get him this far - were safe and well.

Rees and Gord lifted Nead bodily through the open port. His legs swinging as if carved from wood, the injured Scientist shoved himself off in

the direction of a jet mounting. Rees and Gord waited in the open doorway, the securing rope in their hands.

Nead slowed a few feet short of the jet mount. Rees watched anxiously as Nead scrabbled at the frictionless surface of the hull. Then the mount came within reach and he grabbed at it gratefully, locking his fingers around small irregularities in the iron surface.

He hauled on his ropes. Gord and Rees bundled the first steam jet out of the port and shoved it towards the young Scientist. They judged it well, the package of machinery stopping a few feet short of Nead. With fast but precise motions Nead dragged at his rope and fielded the machine. Now the Scientist had to align the jet, at least roughly, with the Bridge's axis, and he spent long seconds struggling with the old device's bulk.

At last it was correct. From a chest pocket Nead dragged out adhesive pads and slapped them against the mount; then, the strain showing on his face, he hauled the machine into place over the pads. Finally he untied the rope from the secured jet and cast it free.

Nead had worked fast and well, but already some thirty seconds had passed. The bulk of the work had still to be performed, and the pain in Rees's chest was reaching a hollow crescendo.

Now Nead scrambled towards the next mount, over the curve of the hull and out of sight. After unbearably long seconds there was a tugging on one rope. Rees and the mine engineer threw the second steam jet through the hatch. The bulky machine bumped around the hull.

It was impossible to gauge the passage of time. Had only seconds passed since they had launched the machine?

Without reference points time was an elastic thing . . . Blackness closed around Rees's vision.

There was a flurry of motion to his right. He turned, his chest burning. Gord had begun to haul on the rope, his face blue now and his eyes protruding. Rees joined him. The rope moved disturbingly easily, sliding unimpeded over the frictionless surface.

A sense of dread blossomed alongside Rees's pain.

The end of the rope came rushing around the curve of the hull. The line had been neatly cut.

Gord fell back, eyes closing, the effort he had expended apparently pushing him over the brink into unconsciousness. Rees, his vision failing,

placed his palm over the door’s control panel.

And waited.

Gord slumped against the door frame. Rees’s lungs were a jelly of pain, and his throat tore at the empty air . . .

A blur before him, hands gripping the rim of the door frame, a face contorted around blue lips, a stiff body with strapped legs . . . Nead, he realized dully; Nead had returned, and there was something he had to do.

His arm, as if independent of his will, spasmed against the port’s control panel. The port slid shut. Then the inner door opened and he was pulled backwards into the thickening air.

Later Nead explained, his voice a rasp: ‘I could feel I was running out of time, and I still wasn’t finished. So I cut the rope and kept going. I’m sorry.’

‘You’re a bloody fool: Rees whispered. He struggled for a while to raise his head from his pallet; then he gave up, slumped back, and drifted back to sleep.

With Nead’s jets they guided the ship into a wide, elliptical orbit around a hot yellow star deeper inside the new nebula. The great doors were hurled open and men crawled around the hull attaching climbing ropes and fixing fresh steam jets. Thin, bright air suffused the musty interior of the ship; the stink of recycled and tanked air was dispelled at last and a mood of celebration spread among the passengers.

Even the ration queues seemed good-humoured.

The bodies of those who had not survived the crossing were lifted from the ship, wrapped in rags and dropped into the air. Rees glanced around the knot of mourners gathered at the port. He observed suddenly what a mix of people they were now: there were Raft folk like Jaen and Grye, alongside Gord and other miners; and there was Quid and his party of Boneys. They all mingled quite unselfconsciously, united by grief and pride. The old divisions meant nothing, Rees realized; in this new place there were only humans . . .

Eventually the Bridge would move on from this star but these bodies would remain here in orbit for many shifts, marking man’s arrival in the new world, before air friction finally carried them into the flames of the star.

Despite the influx of fresh air Hollerbach continued to weaken steadily. At length he took to a pallet fixed before the Bridge's window-like hull. Rees joined the old Scientist; together they gazed out into the new starlight.

Hollerbach fell into a fit of coughing. Rees rested his hand on the old man's head, and at last Hollerbach's breathing steadied. 'I told you you should have left me behind,' he wheezed.

Rees ignored that and leant forward. 'You should have seen the release of the young trees,' he said. 'We just opened the cages and out they flew . . . They've spread out around this star as if they were born here.'

'Perhaps they were,' Hollerbach observed dryly. 'Pallis would have liked that.'

'I don't think any of us younger folk realized how green leaves could be. And the trees seem to be growing already. Soon we'll have a forest big enough to harvest, and we'll be able to move out: find whales, perhaps, fresh sources of food . . .'

Now Hollerbach began to fumble beneath his pallet; with Rees's help he retrieved a small package wrapped in grubby cloth.

'What's this?'

'Take it.'

Rees unwrapped the cloth to expose a finely tooled machine the size of his cupped hands; at its heart a silver orb gleamed, and around the orb multicoloured beads followed wire circles. 'Your orrery,' Rees said.

'I brought it in my personal effects.'

Rees fingered the familiar gadget. Embarrassed, he said: 'Do you want me to have it when you're gone?'

'No, damn it!' Hollerbach coughed indignantly. 'Rees, your streak of sentimentality disturbs me. No, I wish now I'd left the bloody thing behind. Lad, I want you to destroy it. When you throw me out of that door send it after me.'

Rees was shocked. 'But why? It's the only orrery in the universe . . . literally irreplaceable.'

'It means nothing!' The old eyes glittered. 'Rees, the thing is a symbol of a lost past, a past we must disregard. We have clung to such tokens for far too long. Now we are creatures of this universe.'

With sudden intensity the old man grabbed Rees's sleeve and seemed to be trying to pull himself upright. Rees, frowning, laid a hand on his

shoulder and gently pressed him back. ‘Try to rest—’

‘Bugger that,’ Hollerbach rasped. ‘I haven’t time to waste on resting . . . You have to tell them—’

‘What?’

‘To spread. Fan out through this nebula. We’ve got to fill every niche we can find here; we can’t rely on relics of an alien past any more. If we’re to prosper we must become natives of this place, find ways to live here, using our own ingenuity and resources . . .’ Another coughing jag broke up his words. ‘I want that population explosion we spoke of. We can’t ever again risk the future of the race in a single ship, or even a single nebula. We have to fill this damn cloud, and go on to the other nebulae and fill them as well. I want not just thousands but millions of humans in this damn place, talking and squabbling and learning.

‘And ships . . . we’ll need new ships. I see trade between the inhabited nebulae, as if they were the legendary cities of old Earth. I see us finding a way even to visit the realms of the gravitic creatures . . .

‘And I see us one day building a ship that will fly us back through Bolder’s Ring, the gateway to man’s home universe. We’ll return and tell our cousins there what became of us . . .’ At last Hollerbach’s energy was exhausted; the grey head slumped back against its rag pillow, eyes closing slowly.

When it was over Rees carried him to the port, the orrery wrapped in the stilled fingers. Silently he launched the body into the crisp air and watched it drift away until it was lost against the background of the falling stars; then, as Hollerbach had wished, he hurled the orrery into the sky. Within seconds it had vanished.

There was a warm mass at his side - Jaen, standing quietly with him. He took her hand, squeezing it gently, and his thoughts began to run along new, unexplored tracks. Now that the adventure was over perhaps he and Jaen might think about a new kind of life, of a home of their own—

Jaen gasped. She pointed. ‘Rees . . . look.’

Something came lunging out of the sky. It was a compact, pale green wheel of wood, like a tree six feet wide. It snapped to a halt mere yards from Rees’s face and hovered there, maintaining its position with rapid flicks of rotation. Short, fat limbs snaked out of the trunk, and what looked

like tools of wood and iron were fixed at various points to the rim. Rees searched in vain for the tree's tiny pilots.

'By the Bones, Rees,' Jaen snapped, 'what the hell is it?' Four eyes, blue and shockingly human, snapped open in the upper surface of the trunk and fixed them with a stern gaze.

Rees grinned. The adventure, he realized, was far from over.

In fact, it might barely have begun.

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TIMELIKE INFINITY

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1

The flitter rose from occupied Earth like a stone thrown from a blue bowl. The little cylindrical craft tumbled slowly as it climbed, sparkling.Qax Jasoft Parz had been summoned to a meeting, in orbit, with the Qax Governor of Earth. Parz scoured a mind worn into grooves of habit by his years in the diplomatic service for reasons for this summons. It must be connected with the arrival of the damned wormhole, of course - that had stirred up the Qax like a stick in a hornets' nest.

But why summon him now? What had changed?

As his distance from the planet increased, so grew Parz's apprehension.

Alone in the automated flitter, Parz watched shafts of cerulean Earthlight thread through the small ports and, twisting with the craft's rotation, dissect the dusty air around him. As always, the glowing innocence of the planet took his breath away. Two centuries of Qax occupation had left few visible scars on Earth's surface - far fewer, in fact, than those wrought by humans during their slow, haphazard rise to technological civilization. But still it was disturbing to see how the Qax-run plankton farms bordered every continent in green; and on the land, scattered and gleaming plains of glass marked man's brief and inglorious struggle against the Qax.

Parz had studied these mirrored landscapes from space - how many times before? A hundred, a thousand times? And each time he had struggled to recall the reactions of his youth on first seeing the sites of the destroyed cities. That liberating, burning anger; the determination not to compromise as those around him had compromised. Yes, he would work within the system - even carve out a career in the hated diplomatic service, the collaborative go-between of human and Qax. But his purpose had been to find a way to restore the pride of man.

Well, Jasoft, he asked himself; and what has become of those fine intentions? Where did they get lost, over all these muddy years? Parz probed at his leathery old emotions. Sometimes he wondered if it were possible for him genuinely to feel anything any more; even the city-scars had been degraded in his perception, so that now they served only as convenient triggers of nostalgia for his youth.

Of course, if he wished, he could blame the Qax even for his very aging. Had the Qax not destroyed mankind's AntiSenescence technology base

within months of the Occupation?

Sometimes Parz wondered how it would feel to be an AS-preserved person. What would nostalgia be, for the permanently young?

A soft chime sounded through the flitter, warning Parz that his rendezvous with the Spline fleet was less than five minutes away. Parz settled back in his seat and closed his eyes, sighing a little as semi-sentient cushions adjusted themselves to the curvature of his spine and prodded and poked at aching back muscles; he rested his bony, liver-spotted fingers on the briefcase which lay on the small table before him. He tried to focus on his coming meeting with the Governor. This was going to be a difficult meeting - but had they ever been easy? Parz's challenge was going to be to find a way to calm the Governor, somehow: to persuade it not to take any drastic action as a result of the wormhole incident, not to stiffen the Occupation laws again.

As if on cue the mile-wide bulk of the Governor's Spline flagship slid into his view, dwarfing the flitter and eclipsing Earth. Parz could not help but quail before the Spline's bulk. The flagship was a rough sphere, free of the insignia and markings which would have adorned the human vessels of a few centuries earlier. The hull was composed not of metal or plastic but of a wrinkled, leathery hide, reminiscent of the epidermis of some battered old elephant. This skin-hull was punctured with pockmarks yards wide, vast navels within which sensors and weapons glittered suspiciously. In one pit an eye rolled, fixing Parz disconcertingly; the eye was a gleaming ball three yards across and startlingly human, a testament to the power of convergent evolution. Parz found himself turning away from its stare, almost guiltily. Like the rest of the Spline's organs the eye had been hardened to survive the bleak conditions of spaceflight - including the jarring, shifting perspectives of hyperspace - and had been adapted to serve the needs of the craft's passengers. But the Spline itself remained sentient, Parz knew; and he wondered now how much of the weight of that huge gaze came from the awareness of the Spline itself, and how much from the secondary attention of its passengers.

Parz pushed his face closer to the window. Beyond the Spline's fleshy horizon, a blue, haunting sliver of Earth arced across the darkness; and to the old man it felt as if a steel cable were tugging his heart to that inaccessible slice of his home planet. And above the blue arc he saw

another Spline ship, reduced by perspective to the size of his fist. This one was a warship, he saw; its flesh-hull bristled with weapon emplacements - most of them pointing at Parz, menacingly, as if daring him to try something. The vast threat of the mile-wide battleship struck Parz as comical; he raised a bony fist at the Spline and stuck out his tongue.

Beyond the warship, he saw now, sailed yet another Spline craft, this one a mere pink-brown dot, too distant for his vision - augmented as it was by corneal and retinal image-enhancing technology - to make out details. And beyond that still another Spline rolled through space. Like fleshy moons the fleet encircled the Earth, effortlessly dominant.

Parz was one of only a handful of humans who had been allowed off the surface of the planet since the imposition of the Qax occupation laws, one of still fewer who had been brought close to any section of the main Qax fleet.

Humans had first emerged from their home planet two and a half millennia earlier, optimistic, expanding and full of hope . . . or so it seemed to Jasoft now. Then had come the first contact with an extra-solar species - the group-mind entity known as the Squeem - and that hope had died.

Humans were crushed; the first occupation of Earth began.

But the Squeem were overthrown. Humans had travelled once more from Earth.

Then the Qax had found a human craft.

There had been a honeymoon period. Trading links with the Qax had been established, cultural exchanges discussed.

It hadn’t lasted long.

As soon as the Qax had found out how weak and naïve humanity really was, the Spline warships had moved in.

Still, that brief period of first contact had provided humanity with most of its understanding about the Qax and their dominion. For instance, it had been learned that the Spline vessels employed by the Qax were derived from immense, sea-going creatures with articulated limbs, which had once scoured the depths of some world-girdling ocean. The Spline had developed spaceflight, travelled the stars for millennia. Then, perhaps a million years earlier, they had made a strategic decision.

They rebuilt themselves.

They had plated over their flesh, hardened their internal organs - and had risen from the surface of their planet like mile-wide, studded balloons. They had become living ships, feeding on the thin substance between the stars.

The Spline had become carriers, earning their place in the universe by hiring themselves out to any one of a hundred species.

It wasn't a bad strategy for racial survival, Parz mused. The Spline must work far beyond the bubble of space explored by humankind before the Qax Occupation - beyond, even, the larger volume worked by the Qax, within which humanity's sad little zone was embedded.

Someday the Qax would be gone, Parz knew. Maybe it would be humanity which would do the overthrowing; maybe not. In any event there would be trade under the governance of a new race, new messages and material to carry between the stars. New wars to fight. And there would be the Spline, the greatest ships available - with the probable exception, Parz conceded to himself, of the unimaginable navies of the Xeelee themselves - still plying between the stars, unnoticed and immortal.

The small viewport glowed briefly crimson, its flawed plastic sparkling with laser speckle. Then a translator box built somewhere into the fabric of the flitter hissed into life, and Parz knew that the Spline had established a tight laser link. Something inside him quivered further now that the climax of his journey approached; and, when the Qax Governor of Earth finally spoke to him in its flat, disturbingly feminine voice, he flinched.

'Ambassador Parz. Your torso is arranged at an awkward angle in your chair. Are you ill?'

Parz grimaced. This was the nearest, he knew, that a Qax would ever come to a social nicety; it was a rare enough honour, accorded to him by his long relationship with the Governor. 'My back is hurting me, Governor,' he said. 'I apologize. I won't let it distract my attention from our business.'

'I trust not. Why don't you have it repaired?'

Parz tried to compose a civil answer, but the forefront of his consciousness was filled once more with a distracting awareness of his own aging. Parz was seventy years old. If he had lived in the years before the coming of the Qax, he would now be entering the flush of his maturity, he supposed, his body cleansed and renewed, his mind refreshed, reorganized, rationalized, his reactions rendered as fresh as a child's. But

AntiSenescence technology was no longer available; evidently it suited the Qax to have humanity endlessly culled by time. Once, Parz recalled, he had silently raged at the Qax for this imposition above all: for the arbitrary curtailment of billions of immortal human lives, for the destruction of all that potential. Well, he didn't seem to feel anger at anything much any more . . .

But, he thought bitterly, of all the plagues which the Qax had restored to mankind, he would never forgive them his aching back.

'Thank you for your kindness, Governor,' he snapped. 'My back is not something which can be fixed. It is a parameter within which I must work, for the rest of my life.'

The Qax considered that, briefly; then it said, 'I am concerned that your functionality is impaired.'

'Humans no longer live forever, Governor,' Parz whispered. And he dared to add: 'Thank God.' This was the only consolation of age, he reflected tiredly - wriggling in the chair to encourage it to probe harder at his sore points - that meetings like these must, surely, soon, come to an end.

'Well,' said the Qax, with a delicate touch of irony in its sophisticated artificial voice, 'let us proceed before your bodily components fail altogether. The wormhole. The object is now within the cometary halo of this system.'

'Within the Oort Cloud, yes. Barely a third of a light-year from the Sun.'

Parz waited for a few seconds for the Qax to indicate specifically why he'd been brought here. When the Qax said nothing he drew data slates from his briefcase and scrolled down lists of facts, diagrams, running over the general briefing he had prepared earlier.

'It is an ancient human artefact,' the Qax said.

'Yes.' Parz retrieved an image on his slate - glowing frameworks against a salmon-pink background - and pressed keys to dump it through the tabletop and down the link to the Governor. 'This is a video image of the launch of the wormhole from the orbit of Jupiter, some fifteen hundred years ago. It was known as the Interface project.' He touched a fingernail to the slate to indicate the details. 'In essence, two tetrahedral frameworks were constructed. Each framework was about three miles wide. The frameworks held open the termini of a spacetime wormhole.' He looked up,

vaguely, in the direction of the ceiling. Not for the first time he wished he had some image of the Governor on which to fix his attention, just a little something to reduce the disorienting nature of these meetings; otherwise he felt surrounded by the awareness of the Governor, as if it were some huge god. ‘Governor, do you want details? A wormhole permits instantaneous travel between two spacetime points by—’

‘Continue.’

Parz nodded. ‘One tetrahedral framework was left in orbit around Jupiter, while the other was transported at sublight speeds away from the Earth, in the direction of the centre of the Galaxy.’

‘Why that direction?’

Parz shrugged. ‘The direction was unimportant. The objective was merely to take one end of the wormhole many light-years away from the Earth, and later to return it.’

Parz’s table chimed softly. Images, now accessed directly by the Qax, scrolled across his slate: engineering drawings of the tetrahedra from all angles, pages of relativistic equations . . . The portal frameworks themselves looked like pieces of fine art, he thought; or, perhaps, jewellery, resting against the mottled cheek of Jupiter.

‘How were the tetrahedra constructed?’ the Qax asked.

‘From exotic matter.’

‘From what?’

‘It’s a human term,’ Parz snapped. ‘Look it up. A variant of matter with peculiar properties which enable it to hold open the termination of a wormhole. The technology was developed by a human called Michael Poole.’

‘You know that when humankind was brought into its present close economic relationship with the Qax, the second terminal of this wormhole - the stationary one, still orbiting Jupiter - was destroyed,’ the Governor said.

‘Yes. You do tend to destroy anything you do not understand,’ Parz said drily.

The Qax paused. Then it said, ‘If the malfunctioning of your body is impairing you, we may continue later.’

‘Let’s get it over with.’ Parz went on, ‘After fifteen centuries, the other end of the wormhole is returning to the Solar System. It is being towed by the *Cauchy*, a freighter of ancient human design; we speculate that

relativistic effects have preserved living humans aboard the freighter, from the era of its launch.'

'Why is it returning?'

'Because that was the mission profile. Look.' Parz downloaded more data into the table. 'They were due to return about now, and so they have.'

The Qax said, 'Perhaps, since the destruction of the second, stationary tetrahedron, the wormhole device will not function. We should therefore regard this - visit from the stars - as no threat. What is your assessment?'

'Maybe you're right.'

'How could we be wrong?'

'Because the original purpose of the Interface project was not to provide a means of travelling through space . . . *but through time*. I am not a physicist, but I doubt that your destruction of the second terminus will have destroyed its functionality.'

Parz's slate now filled with a simple image of a tetrahedral framework; the image had been enhanced to the limit of the telescopic data and the picture was sharp but bleached of detail.

The Governor said, 'You are implying that we may be witnessing here a functioning time machine? - a passage, a tunnel through time which connects us to the humanity of fifteen centuries ago?'

'Yes. Perhaps we are.' Parz stared at the image, trying to make out detail in the faces of the tetrahedron. Was it possible that just beyond those sheets of flawed space was a Solar System free of the domination of the Qax - a system peopled by free, bold, immortal humans, brave enough to conceive such an audacious project as the Interface? He willed himself to see through these grainy pixels into a better past. But there was insufficient data in this long-range image, and soon his old eyes felt rheumy and sore, despite their enhancements.

The Qax had fallen silent.

With the image still frozen on the screen, Parz settled back into his chair and closed his aching eyes. He was growing tired of the Governor's game. Let it get to the point in its own time.

It was depressing to reflect on how little more had been learned about the Qax during the Occupation: even human ambassadors like Parz were kept at more than arm's length. Still, Parz had used his fleeting contacts to

sift out fragments of knowledge, wisdom, glimpses of the nature of the Qax, all built into the picture that had been handed down from a happier past.

Like everybody else, Parz had never actually seen a Qax. He suspected that they were physically extensive - otherwise, why use Spline freighters to travel? - but, in any event, it was not their physical form but their minds, their motivation, that was so fascinating. He'd become convinced that it was only by knowing the enemy - by seeing the universe through the consciousness of the Qax - that men could hope to throw off the heavy yoke of the Occupation.

He had come to suspect, for instance, that comparatively few individuals comprised the Qax race - perhaps no more than thousands. Certainly nothing like the billions which had once constituted humanity, in the years before the development of AS technology. And he was sure that there were only three or four Qax individuals assigned to the supervision of Earth, orbiting in the warm bellies of their Spline freighters.

This hypothesis had many corollaries, of course.

The Qax were immortal, probably - certainly there was evidence that the same Governor had ruled Earth from the beginning of the Occupation. And with such a small and static population, and with all the time in the world, each Qax would surely come to know the rest of its species intimately.

Perhaps too well.

Parz imagined rivalries building over centuries. There would be scheming, manoeuvring, endless politicking . . . and trading. With such a small and intimate population surely, no form of formal policing could operate. How to build consensus behind any laws? How to construct laws which would not be seen to discriminate against individuals?

. . . But there were natural laws which governed any society. Parz, drifting into a contemplative doze, nodded to himself. It was logical. The Qax must work like so many independent corporations, in pure competition; they would swim in a sea of perfect information about each other's activities and intentions, kept in some semblance of order only by the operation of the laws of economics. Yes; the theory felt right to Parz. The Qax were natural traders. They had to be. And trading relationships would be their natural mode of approaching other species, once they started spreading beyond their own planet.

Unless, as in the case of humanity, other opportunities, too soft and welcoming, beckoned . . .

Parz didn't believe - as many commentators maintained - that the Qax were an innately militaristic species. With such a small number of individuals they could never have evolved a philosophy of warfare; never could they have viewed soldiers (of their own race) as expendable cannon-fodder, as a renewable resource to be husbanded or expended to suit the needs of a conflict. The murder of a Qax must be a crime of unimaginable horror.

No, the Qax weren't warlike. They had defeated humanity and occupied the Earth merely because it had been so easy.

Of course, this wasn't a popular view, and Parz had learned to keep it to himself.

'Ambassador Jasoft Parz.'

The Governor's sharp, feminine voice jarred him to full alertness. Had he actually slept? He rubbed his eyes and sat up - then winced at fresh aches in his spine. 'Yes, Governor. I can hear you.'

'I have brought you here to discuss new developments.'

Parz screwed up his eyes and focused on the slate before him. At last, he thought. He saw the approaching Interface tetrahedron, in an image as devoid of detail as before; the pixels seemed as large as thumbprints. The star background twinkled slowly. 'Is this a recording? Why are you showing me this? This is worse than the data I brought you.'

'Watch.'

Parz, with a sigh, settled back as comfortably as he could; the sentient chair rubbed sympathetically at his back and legs.

Some minutes passed; on the screen the tetrahedron hung on the rim of interstellar space, unchanging.

Then there was an irruption from the righthand side of the screen, a sudden blur, a bolt of pixels which lanced into the heart of the tetrahedron and disappeared.

Parz, forgetting his back, sat up and had the slate replay the image, moment by moment. It was impossible to make out details of any kind, but the meaning of the sequence was clear. 'My God,' he breathed. 'That's a ship, isn't it?'

'Yes,' said the Governor. 'A human ship.'

The Qax produced more reports, shards of detail.

The ship, camouflaged somehow, had exploded from the surface of the Earth. It had reached hyperspace within seconds, before the orbiting Spline fleet could react.

‘And it made it through the tetrahedron?’

‘Apparently a group of humans have escaped into the past. Yes.’

Parz closed his eyes as exultation surged through him, rendering him young again. So this was why he had been called to orbit.

Rebellion . . .

The Qax said, ‘Ambassador. Why did you not warn me of the approach of the Interface device? You say that its mission profile was documented and understood, that it was due to return.’

Parz shrugged. ‘What do you want me to tell you? A mission profile like that, based on the technology of the time, has uncertainty margins measured in centuries. It’s been fifteen hundred years, Governor!’

‘Still,’ said the Governor evenly, ‘you would regard it as your duty to warn me of such events?’

Parz bowed his head ironically. ‘Of course. *Mea culpa*.’ It probably made the Qax feel better to rail at him, he reflected. Well, to absorb blame on behalf of humanity was part of his job.

‘And what of the human evacuees? The ship which escaped? Who built it? How did they conceal their intentions? Where did they obtain their resources?’

Parz smiled, feeling his papery old cheeks crumple up. The tone of the translator box continued as sweetly, as sexily even as ever; but he imagined the Qax boiling with unexpressed rage within its womblike Spline container. ‘Governor, I haven’t the first idea. I’ve failed you, obviously. And do you know what? I don’t give a damn.’ Nor, he realized with relief, did he care about his own personal fate. Not any more.

He had heard that those close to death experienced a calm, an acceptance that was close to the divine - a state that had been taken from humanity by AS technology. Could that describe his mood now, this strange, exultant calmness?

‘Ambassador,’ the Qax snapped. ‘Speculate.’

‘You speculate,’ Parz said. ‘Or are you unable to? Governor, the Qax are traders - aren’t you? - not conquerors. True emperors learn the minds of

their subjects. You haven’t the first idea what is going on in human hearts . . . and that is why you are so terrified now.’ His eyes raked over the faceless interior of the flitter. ‘Your own, awful ignorance in the face of this startling rebellion. That’s why you’re scared, isn’t it?’

The translator box hissed, but was otherwise silent.

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2

Michael Poole's father, Harry, twinkled into existence in the middle of the *Hermit Crab*'s lifedome. Glimmering pixels cast highlights onto the bare, domed ceiling before coalescing into a stocky, smiling, smooth-faced figure, dressed in a single-piece sky-blue suit. 'It's good to see you, son. You're looking well.'

Michael Poole sucked on a bulb of malt whisky and glowered at his father. The roof was opaque, but the transparent floor revealed a plane of comet ice over which Harry seemed to hover, suspended. 'Like hell I am,' Michael growled. His voice, rusty after decades of near-solitude out here in the Oort Cloud, sounded like gravel compared to his father's smooth tones. 'I'm older than you.'

Harry laughed and took a tentative step forward. 'I'm not going to argue with that. But your age is your choice. You shouldn't drink so early in the day, though.'

The Virtual's projection was slightly off, so there was a small, shadowless gap between Harry's smart shoes and the floor; Michael smiled inwardly, relishing the tiny reminder of the unreality of the scene. 'The hell with you. I'm two hundred and seven years old. I do what I please.'

A look of sad affection crossed Harry's brow. 'You always did, son. I'm joking.'

Michael took an involuntary step back from the Virtual; the adhesive soles of his shoes kept him locked to the floor in the weightless conditions of the lifedome. 'What do you want here?'

'I want to give you a hug.'

'Sure.' Michael splashed whisky over his fingertips and sprinkled droplets over the Virtual; golden spheres sailed through the image, scattering clouds of cubical pixels. 'If that was true you'd be speaking to me in person, not through a Virtual reconstruct.'

'Son, you're four light-months from home. What do you want, a dialogue spanning the rest of our lives? Anyway these modern Virtuals are so damned good.' Harry had that old look of defensiveness in his blue eyes now, a look that took Michael all the way back to a troubled boyhood. *Another justification*, he thought. Harry had been a distant father, always

bound up with his own projects - an irregular, excuse-laden intrusion into Michael's life.

The final break had come when, thanks to AS, Michael had grown older than his father.

Harry was saying, 'Virtuals like this one have passed all the Turing tests anyone can devise for them. As far as you're concerned, Michael, this is me - Harry - standing here talking to you. And if you took the time and trouble you could send a Virtual back the other way.'

'What do you want, a refund?'

'Anyway, I had to send a Virtual. There wasn't time for anything else.'

These words, delivered in an easy, matter-of-fact tone, jarred in Michael's mind. 'Wasn't time? What are you talking about?'

Harry fixed him with an amused stare. 'Don't you know?' he asked pointedly. 'Don't you follow the news?'

'Don't play games,' said Michael wearily. 'You've already invaded my privacy. Just tell me what you want.'

Instead of answering directly, Harry gazed down through the clear floor beneath his feet. The core of a comet, a mile wide and bristling with ancient spires of ice, slid through the darkness; spotlight lasers from the *Hermit Crab* evoked hydrocarbon shades of purple and green. 'Quite a view,' Harry said. 'It's like a sightless fish, isn't it? - a strange, unseen creature, sailing through the Solar System's darkest oceans.'

In all the years he'd studied the comet, that image had never struck Michael; hearing the words now he saw how right it was. But he replied heavily, 'It's just a comet. And this is the Oort Cloud. The cometary halo, a third of a light-year from the Sun; where all the comets come to die—'

'Nice place,' Harry said, unperturbed. His eyes raked over the bare dome, and Michael abruptly felt as if he was seeing the place through his father's eyes. The ship's lifedome, his home for decades, was a half-sphere a hundred yards wide. Couches, control panels and basic data entry and retrieval ports were clustered around the geometric centre of the dome; the rest of the transparent floor area was divided up by shoulder-high partitions into lab areas, a galley, a gym, a sleeping area and shower.

Suddenly the layout, Michael's few pieces of furniture, the low single bed, looked obsessively plain and functional.

Harry walked across the clear floor to the rim of the lifedome; Michael, whisky warming in his hand, joined him reluctantly. From here the rest of the *Crab* could be seen. A spine bristling with antennae and sensors crossed a mile of space to a block of Europa ice, so that the complete ship had the look of an elegant parasol, with the lifedome as canopy and the Europa ice as handle. The ice block - hundreds of yards wide when mined from Jupiter's moon - was pitted and raddled, as if moulded by huge fingers. The ship's GUTdrive was buried inside that block, and the ice had provided the ship's reaction mass during Michael's journey out here.

Harry ducked his head, searching the stars. 'Can I see Earth?'

Michael shrugged. 'From here the inner Solar System is a muddy patch of light. Like a distant pond. You need instruments to make out Earth.'

'You've left yourself a long way from home.'

Harry's hair had been AS-restored to a thick blond mane; his eyes were clear blue stars, his face square, small-featured - almost pixie-like. Michael, staring curiously, was struck afresh at how young his father had had himself remade to look. Michael himself had kept the sixty-year-old body the years had already stranded him in when AS technology had emerged. Now he ran an unconscious hand over his high scalp, the tough, wrinkled skin of his cheeks. Damn it, Harry hadn't even kept the colouring - the black hair, brown eyes - which he'd passed on to Michael.

Harry glanced at Michael's drink. 'Quite a host,' he said, without criticism in his voice. 'Why don't you offer me something? I'm serious. You can buy Virtual hospitality chips now. Bars, kitchens. All the finest stuff for your Virtual guests.'

Michael laughed. 'What's the point? None of it's real.'

For a second his father's eyes narrowed. 'Real? Are you sure you know what I'm feeling, right now?'

'I don't give a damn one way or the other,' said Michael calmly.

'No,' Harry said. 'I believe you really don't. Fortunately I came prepared.' He snapped his fingers and a huge globe of brandy crystallized in his open palm; Michael could almost smell its fumes. 'Bit like carrying a hip flask. Well, Michael, I can't say this is a pleasure. How do you live in this godforsaken place?'

The sudden question made Michael flinch, physically. 'I'll tell you how, if you like. I process comet material for food and air; there is plenty of

carbohydrate material, and nitrogen, locked in the ice; and I—'

'So you're a high-tech hermit. Like your ship. A hermit crab, prowling around the rim of the Solar System, too far from home even to talk to another human being. Right?'

'There are reasons,' Michael said, trying to keep self-justification out of his voice. 'Look, Harry, it's my job. I'm studying quark nuggets—'

Harry opened his mouth; then his eyes lost their focus for a moment, and it was as if he were scanning some lost, inner landscape. At length he said with a weak smile: 'Apparently I used to know what that meant.'

Michael snorted with disgust. 'Nuggets are like extended nucleons—'

Harry's smile grew strained. 'Keep going.'

Michael talked quickly, unwilling to give his father any help.

Nucleons, protons and neutrons were formed from combinations of quarks. Under extremes of pressure - at the heart of a neutron star, or during the Big Bang itself - more extended structures could form. A quark nugget, a monster among nucleons, could mass a ton and be a thousandth of an inch wide . . .

Most of the nuggets from the Big Bang had decayed. But some survived.

'And this is why you need to live out here?'

'The first the inner Solar System knows of the presence of a nugget is when it hits the top of an atmosphere, and its energy crystallizes into a shower of exotic particles. Yes, you can learn something from that - but it's like watching shadows on the wall. I want to study the raw stuff. And that's why I've come so far out. Damn it, there are only about a hundred humans further from the Sun, and most of them are light-years away, in starships like the *Cauchy*, crawling at near-lightspeed to God knows where. Harry, a quark nugget sets up a bow wave in the interstellar medium. Like a sparkle of high-energy particles, scattered ahead of itself. It's faint, but my detectors can pick it up, and - maybe one time out of ten - I can send out a probe to pick up the nugget itself.'

Harry tugged at the corner of his mouth - a gesture which reminded Michael jarringly of the frail eighty-year-old who had gone for ever. 'Sounds terrific,' Harry said. 'So what?'

Michael bit back an angry response. 'It's called basic research,' he said. 'Something we humans have been doing for a couple of thousand years now

—’

‘Just tell me,’ Harry said mildly.

‘Because quark nuggets are bundles of matter pushed to the extreme. Some can be moving so close to lightspeed that, thanks to time dilation, they reach my sensors barely a million subjective years after leaving the singularity itself.’

‘I guess I’m impressed.’ Harry sucked on his brandy, turned and walked easily across the transparent floor, showing no signs of vertigo or distraction. He reached a metal chair, sat on it and crossed his legs comfortably, ignoring the zero-gravity harness. The illusion was good this time, with barely a thread of space between the Virtual’s thighs and the surface of the chair. ‘I always was impressed with what you achieved. You, with Miriam Berg, of course. I’m sure you knew that, even if I didn’t say it all that often.’

‘No, you didn’t.’

‘Even a century ago you were *the* authority on exotic matter. Weren’t you? That was why they gave you such responsibility on the Interface project.’

‘Thanks for the pat on the head.’ Michael looked into the sky-blue emptiness of his father’s eyes. ‘Is that what you’ve come to talk about? What did you retain when you had your head cleaned out? Anything?’

Harry shrugged. ‘What I needed. Mostly stuff about you, if you want to know. Like a scrapbook . . .’

He sipped his drink, which glowed in the light of the comet, and regarded his son.

Wormholes are flaws in space and time which connect points separated by light-years - or by centuries - with near-instantaneous passages of curved space. They are useful . . . but difficult to build.

On the scale of the invisibly small - on Planck lengthscales, in which the mysterious effects of quantum gravity operate - spacetime is foamlike, riddled with tiny wormholes. Michael Poole and his team, a century earlier, had pulled such a wormhole out of the foam and manipulated its mouths, distorting it to the size and shape they wanted.

Big enough to take a spacecraft.

That was the easy part. Now they had to make it stable.

A wormhole without matter in its throat- a ‘Schwarzschild’ solution to the equations of relativity - is unusable. Lethal tidal forces would bar the wormhole portals, the portals themselves would expand and collapse at lightspeed, and small perturbations caused by any infalling matter would result in instability and collapse.

So Poole’s team had had to thread their wormhole with ‘exotic’ matter.

Space contracted towards the centre of the throat and then had to be made to expand again. A repulsive effect in the throat had come from exoticity, the negative energy density of the exotic matter. The wormhole was still intrinsically unstable, even so; but with feedback loops it could be made self-regulating.

At one time negative energy had been thought impossible. Like negative mass, the concept seemed intuitively impossible. But there had been encouraging examples for Michael and his team. Hawking evaporation of a black hole was a kind of mild exoticity ... But the negative energy levels Poole had needed were high, equivalent to the pressure at the heart of a neutron star.

It had been a challenging time.

Despite himself Michael found memories of those days filling his head, more vivid than the image of the washed-out lifedome, the imperfect one of his father. Why was it that old memories were so compelling? Michael and his team - including Miriam, his deputy - had spent more than forty years in a slow orbit around Jupiter; the exotic-matter process had depended on the manipulation of the energies of the magnetic flux tube which connected Jupiter to its moon, Io. Life had been hard, dangerous - but never dull. As the years had worn away they had watched again and again as the robot probes dipped into Jupiter’s gravity well and returned with another holdful of shining exotic material, ready to be plated over the growing tetrahedra of the portals.

It had been like watching a child grow.

Miriam and he had grown to depend on each other, completely, without question. Sometimes they had debated if this dependence contained the germ of love. Mostly, though, they had been too busy.

‘You were never happier than in those times, were you, Michael?’ Harry asked, disconcertingly direct.

Michael bit back a sharp, defensive reply. ‘It was my life’s work.’

‘I know it was. But it wasn’t the *end* of your life.’

Michael gripped the whisky globe harder, feeling its warm smoothness glide under his fingers. ‘It felt like it, when the *Cauchy* finally left Jupiter’s orbit towing one of the Interface portals. I’d proved that exotic material was more than just a curiosity; that it could be made available for engineering purposes on the greatest of scales. But it was an experiment that was going to take a century to unfold—’

‘Or fifteen centuries, depending on your point of view.’

The *Cauchy* was dispatched on a long, near lightspeed jaunt in the direction of Sagittarius - towards the centre of the Galaxy. It was to return after a subjective century of flight - but, thanks to time dilation effects, to a Solar System fifteen centuries older.

And that was the purpose of the project.

Michael had sometimes studied Virtuals of the wormhole portal left abandoned in Jovian orbit; it was aging at the same rate as its twin aboard the *Cauchy*, just as he and Miriam were. But, while Miriam and Michael were separated by a growing ‘distance’ in Einsteinian spacetime - a distance soon measured in light-years and centuries - *the wormhole still joined the two portals*. After a century of subjective time, for both Michael and Miriam, the *Cauchy* would complete its circular tour and return to Jovian orbit, lost in Michael’s future.

And then it would be possible, using the wormhole, to step in a few hours across fifteen centuries of time.

The departure of the ship, the waiting for the completion of the circuit, had left a hole in Michael’s life, and in his heart.

‘I found I’d become an engineer rather than a scientist ... I’d restricted my attention to the single type of material we could fabricate in our Io fluxtube accelerators; the rest of exotic physics remained untouched. So I decided—’

‘To run away?’

Again Michael was stabbed by anger.

His father leaned forward from the chair, hands folded before him; the grey light from the comet below played over his clear, handsome face. The brandy glass was gone now, Michael noticed, a discarded prop. ‘Damn it, Michael; you had become a powerful man. It wasn’t just science, or engineering. To establish and complete the Interface project you had to

learn how to build with people. Politics. Budgets. Motivation. How to run things; how to manage - how to achieve things in a world of human beings. You could have done it again, and again; you could have built whatever you wanted to, having learned how.

'And yet you turned away from it all. You ran and hid out here. Look, I know how much it must have hurt, when Miriam Berg decided to fly out with the *Cauchy* rather than stay with you. But—'

'I'm not hiding, damn you,' Michael said, striving to mask a flare of anger. 'I've told you what I'm doing out here. The quark nuggets could provide new insight into the fundamental structure of matter—'

'You're a dilettante,' Harry said, and he sat back in his chair dismissively. 'That's all. You have no control over what comes wafting in to you from the depths of time and space. Sure, it's intriguing. But it isn't science. It's collecting butterflies. The big projects in the inner system, like the Serenitatis accelerator, left you behind years ago.' Harry's eyes were wide and unblinking. 'Tell me I'm wrong.'

Michael, goaded, threw his whisky globe to the floor. It smashed against the clear surface, and the yellow fluid, pierced by comet light, gathered stickily around rebounding bits of glass. 'What the hell do you want?'

'You let yourself grow old, Michael,' Harry said sadly. 'Didn't you? And - worse than that - you let yourself stay old.'

'I stayed human,' Michael growled. 'I wasn't going to have the contents of my head dumped out into a chip.'

Harry got out of his chair and approached his son. 'It isn't like that,' he said softly. 'It's more like editing your memories. Classifying, sorting, rationalizing.'

Michael snorted. 'What a disgusting word that is.'

'Nothing's lost, you know. It's all stored - and not just on chips, but in neural nets you can interrogate - or use to feed Virtuals, if you like.' Harry smiled. 'You can talk to your younger self. Sounds like your ideal occupation, actually.'

'Look.' Michael closed his eyes and pressed his fingers against the bridge of his nose. 'I've thought through all of this. I've even discussed it with you before. Or have you forgotten that too?'

'There isn't really a choice, you know.'

'Of course there is.'

‘Not if you want to stay human, as you say you do. Part of being human is to be able to think fresh thoughts - to react to new people, new events, new situations. Michael, the fact is that human memory has a finite capacity. The more you cram in there the longer the retrieval times become. With AS technology—’

‘You can’t make yourself a virgin by transplanting a hymen, for God’s sake.’

‘You’re right.’ Harry reached out a hand to his son - then hesitated and dropped it again. ‘Coarse, as usual, but correct. And I’m not telling you that tidying up your memories is going to restore your innocence. Your thrill at first hearing Beethoven. The wonder of your first kiss. And I know you’re frightened of losing what you have left of Miriam.’

‘You presume a hell of a lot, damn you.’

‘But, Michael - there isn’t an option. Without it, there’s only fossilization.’ Harry smiled ruefully. ‘I’m sorry, son. I didn’t mean to tell you how to run your life.’

‘No. You never did, did you? It was always just a kind of habit.’ Michael crossed to a serving hatch and, with rapid taps at a keypad icon, called up another whisky. ‘Tell me what was so urgent that you had to beam out a Virtual package.’

Harry paced slowly across the clear floor; his silent footsteps, weight-laden in the absence of gravity and suspended over the ocean of space, gave the scene an eerie quality. ‘The Interface,’ he said.

Michael frowned. ‘The project? What about it?’

Harry considered his son with genuine sympathy. ‘I guess you really have lost track of your life, out here. Michael, it’s a century now since the launch of the *Cauchy*. Don’t you recall the mission plan?’

Michael thought it over. A century—

‘My God,’ Michael said. ‘It’s time, isn’t it?’

The *Cauchy* should have returned to Sol, in that remote future. Michael cast an involuntary glance up at the cabin wall, in the direction of Jupiter. The second wormhole portal still orbited Jupiter patiently; was it possible that - even now - a bridge lay open across a millennium and a half?

‘They sent me to fetch you,’ Harry was saying ruefully. ‘I told them it was a waste of time, that we’d argued since you were old enough to talk.

But they sent me anyway. Maybe I'd have a better chance than anybody else of persuading you.'

Michael felt confused. 'Persuading me to do what?'

'To come home.' The Virtual glanced around the cabin. 'This old tub can still fly, can't she?'

'Of course she can.'

'Then the quickest way for you to return is to come in voluntarily in this thing. It will take you about a year. It would take twice as long to send a ship out to fetch you—'

'Harry. Slow down, damn it. Who are "they"? And why am I so important, all of a sudden?'

'"They" are the Jovian government. And they have the backing of all the intergovernmental agencies. System-wide, as far as I know. And you're important because of the message.'

'What message?'

Harry studied his son, his too-young face steady, his voice level. 'Michael, the portal has returned. And something's emerged from the wormhole. A ship from the future. We've had one message from it, on microwave wavelengths; we suspect the message was smuggled out, against the will of whoever's operating the ship.'

Michael shook his head. Maybe he *had* let himself get too old; Harry's words seemed unreal - like descriptions of a dream, impossible to comprehend. 'Could the message be translated?'

'Fairly easily,' said Harry drily. 'It was in English. Voice, no visual.'

'And? Come on, Harry.'

'It asked for you. By name. It was from Miriam Berg.'

Michael felt the breath seep out of him, against his will.

His father's Virtual crouched before him, one hand extended, close enough to Michael's face for him to make out individual pixels. 'Michael? Are you all right?'

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3

Again Jasoft Parz was suspended in space before a Spline ship. The freighter was a landscape of grey flesh. Parz peered into an eyeball which, swivelling, gazed out at him from folds of hardened epidermis, and Parz felt a strange sense of kinship with the Spline, this fellow client creature of the Qax.

Parz was aware of a hundred weapons trained upon his fragile flitter - perhaps even including the fabled gravity-wave starbreaker beams, purloined by the Qax from the Xeelee.

He wanted to laugh. A wall of non-existence was, perhaps, hurtling towards them from out of the altered past, and yet still they brandished their toy weapons against an old man.

‘Ambassador Jasoft Parz.’ The Governor’s translated voice was, as ever, soft, feminine and delicious, and quite impossible to read.

Parz kept his voice steady. ‘I am here, Governor.’

There was a long silence. Then the Governor said: ‘I must ask your help.’

Parz felt a kind of tension sag out of him, and it was as if the muscles of his stomach were folding over each other. How he had dreaded this call to meet with the Governor - his first journey into orbit since that fateful moment a week earlier when he had been forced to witness the humiliation of the Qax at the hands of the rebellious rabble who had escaped through the Interface portal. Parz had returned to his normal duties - though that had been difficult enough; even the rarefied diplomatic circles which controlled the planet were alive with talk of that single, staggering, act of defiance. At times Parz had longed to walk away from the heavy cordon of security which surrounded his life and immerse himself in the world of the common man. He would be destroyed as soon as they discovered he was a collaborator, of course ... but maybe it would be worth it, to hear the delicious note of hope on a thousand lips.

But he had not the courage, or the foolhardiness, to do any such thing. Instead he had waited for the Governor to decide what to do. It would be quite within the imagination of the Qax to find a way to punish the planet as a whole for the actions of a few individuals.

Deaths would not have surprised Parz.

Paradoxically he had always found it hard to blame the Qax for this sort of action. To establish control of Earth and its sister worlds the Qax had merely had to study history and adapt methods used by humans to oppress their fellows. There was no evidence that the Qax had ever evolved such tactics as means of dealing with each other. The Qax were acting as had oppressors throughout human history, Parz thought, but still humanity had only itself to blame; it was as if the Qax were an externalized embodiment of man's treatment of man, a judgement of history.

But, in the event, nothing of the sort had happened. And now Parz had been called to another secure orbital meeting.

'Tell me what you want, Governor.'

'We believe we have made the Interface portal secure,' the Qax began. 'It is ringed by Spline warships. Frankly, any human who ventures within a million miles of the artifact will be discontinued.'

Parz raised his eyebrows. 'I'm surprised you've not destroyed the portal.'

Again that uncharacteristic hesitation. 'Jasoft Parz, I find myself unable to determine the correct course of action. A human vessel, manned by rebels against the Qax administration, has escaped fifteen centuries into the past - into an era in which the Qax had no influence over human affairs. The intention of these rebels is surely to change the evolution of events in some way, presumably to prepare humanity to resist, or throw off, the Qax administration.

'Parz, I have to assume that the past has already been altered by these rebels.'

Parz nodded. 'And were you to destroy the portal you would lose the only access you have to the past.'

'I would lose any possible control over events. Yes.'

Parz shifted his position in his chair. 'And have you sent anything through?'

'Not yet,'

Parz laughed. 'Governor, it's been a week. Don't you think you're being a little indecisive? Either close the damn thing or use it; one way or the other you're going to have to act.'

And all the time you procrastinate, he added silently, *the wall of unreality approaches us all at an unknowable speed . . .*

Parz expected a harsh reply to his goad, but instead there was again that hesitancy. ‘I find myself unable to formulate a plan of action. Ambassador, consider the implications. These human rebels control history, over one and a half thousand years. I have tried to evaluate the potential for damage indicated by this, but no algorithm has been able to deliver even an order-of-magnitude assessment. I believe the danger is - in practical terms - infinite ... My race has never faced such a threat, and perhaps never will again.’

Jasoft pulled at his lip. ‘I almost sympathize with you, Governor.’

There had been a flurry of speculation about the effects of the rebels’ escape into the past among what was left of the human scientific community, too. Could the rebels truly alter history? Some argued that their actions would only cause a broadening of probability functions - that new alternative realities were being created by their actions. Others maintained that reality had only a single thread, opened to disruption by the creation of the rebels’ ‘closed timelike curve’, their path through spacetime into the past.

In either event, no one knew whether consciousness could persist through such a disruption - would Jasoft know if the world, his own history, altered around him? Or would he go through a mini-death, to be replaced by a new, subtly adjusted Jasoft? Nor were there any estimates of the rate - in subjective terms - at which the disruption was approaching, emerging from the past as if from the depths of some dismal sea.

To Jasoft such speculation seemed unreal - and yet it also lent an air of unreality to the world he inhabited, as if his life were all no more than a brightly painted surface surrounding a vacuum. He wasn’t afraid - at least he didn’t think so - but he sensed that his grip on reality had been disturbed, fundamentally.

It was like, he suspected, becoming mildly insane.

‘Ambassador, report on what you have determined about the rebels.’

Jasoft pulled his slate from his briefcase, set it up on the tabletop before him and ran his fingers over its surface, drawing data from its heart. ‘We believe the rebels constitute a group calling themselves the Friends of Wigner. Before this single, astonishing action, the Friends were dismissed as a fringe sect of no known danger to the regime.’

‘We have a conscious policy of ignoring such groups,’ the Qax said grimly. ‘Adapted from the policies of such human colonial powers as the Roman Empire, who allowed native religions to flourish ... Why waste effort suppressing that which is harmless? Perhaps this policy will have to be reviewed.’

Parz found himself shuddering at the menace implicit in that last, lightly delivered sentence. ‘I’d advise against it,’ he said quickly. ‘After all, as you say, the damage is already done.’

‘What is known of the vessel?’

Jasoft reported that the craft had been assembled underground on the small offshore island still called Britain.

During the decades of the Occupation there had been a programme to remove human capacity for space travel, and, systematically, ships from all over the Solar System and from the nearby stars - the small bubble of space embraced by humans before the Occupation - had been recalled, impounded and broken up in shipyards converted to crude wrecking shops. Nobody knew, even now, how many lone craft there were still avoiding the law of the Qax somewhere between the stars, but with the Solar System and the major extra-solar colonies invested, they could do little damage ...

Until now. The rebel craft had apparently been constructed around the purloined remains of a broken, impounded freighter.

‘And why the name?’ the Qax asked. ‘Who was this Wigner?’

Parz tapped his slate. ‘Eugene Wigner. A quantum physicist of the twentieth century: a near-contemporary of the great pioneers of the field - Schrödinger, Heisenberg. Wigner’s subject was quantum solipsism.’

There was a brief silence from the Qax. Then: ‘That means little to me. We must determine the intentions of these Friends, Jasoft; we must find a way to see through their human eyes. I am not human. You must help me.’

Parz spread his hands on the tabletop and gathered his thoughts.

Wigner and his co-workers had tried to evolve a philosophy in response to the fact that quantum physics, while universally accepted, was saturated with dazzling paradoxes which suggested that the external world had no well-defined structure until minds observed it.

‘We humans are a finite, practical species,’ Jasoft said. ‘I live in my head, somewhere behind my eyes. I have intimate control over my body - my hands, my feet - and some control over objects I can pick up and

manipulate.’ He held his slate in his hands. ‘I can move the slate about; if I throw it against the wall it bounces off. The slate is discrete in itself and separate from me.’

But this common-sense view of the universe began to fall apart as one approached the smallest scales of creation.

‘Uncertainty is at the heart of it. I can measure the position of my slate by, say, bouncing a photon off it and recording the event in a sensor. But how do I record the position of an electron? If I bounce off a photon, I knock the electron away from where I measured it ... Suppose I measured the electron’s position to within a billionth of an inch. Then my uncertainty about the electron’s momentum would be so high that a second later I couldn’t be sure where the damn thing was within a hundred miles.

‘So I can never be simultaneously sure where an electron is *and* where it’s going ... Instead of thinking of an electron, or any other object, as a discrete, hard little entity, I have to think in terms of probability wave functions.’

Schrödinger had developed equations which described how probability waves shifted and evolved, in the presence of other particles and forces. Parz closed his eyes. ‘I imagine space filled with probability, like blue ripples. If I had vision good enough, maybe I could see the waves in all their richness. But I can’t. It’s like looking through half-closed eyes; and all I can make out is the shadowy places where the peaks and troughs occur. And I say to myself - there; that’s where the electron is. But it isn’t; it’s just a crest of the wave ... Where the wave function has its peaks is where I’m most likely to find my electron - but it’s not the only possibility.’

‘But the wave functions collapse on observation, of course,’ the Qax prompted.

‘Yes.’ The link between quantum reality and the world of the senses - human senses - came when measurements were made. ‘I run my experiment and determine that the electron is in fact, at this instant’ - He stabbed the tabletop with a fingertip - ‘right there. Then the position wave function has collapsed - the probabilities have all gone to zero, except in the little region of space within which I’ve pinned down the electron. Of course as soon as the measurement is over, the wave functions start evolving again, spreading out around the electron’s recorded position.’ Parz frowned. ‘So, by observing, I’ve actually changed the fundamental properties of the electron.

It’s not possible to separate the observer from the observed ... and you could argue that by observing I’ve actually evoked the existence of the electron itself.

‘And there lies the mystery. The paradox. Schrödinger imagined a cat locked in a box with a single unstable nucleus. In a given period there is a fifty-fifty chance that the nucleus will decay. If it does, the cat will be killed by a robot mechanism. If it doesn’t, the cat is allowed to live.

‘Now. Leave the box aside for its specified period, without looking inside. Tell me: is the cat alive or dead?’

The Qax said without hesitating, ‘There is no paradox. One can only give an answer in terms of probabilities, until the box is opened.’

‘Correct. Until the box is opened, the wave function of the box-cat system is not collapsed. The cat is neither alive nor dead; there is equal probability of either state.’

But Wigner took Schrödinger’s paradox further. Suppose the box were opened by a friend of Wigner’s, who saw whether the cat were alive or dead. The box, cat and friend would now form a larger quantum system with a more complex wave function in which the state of the cat - and the friend - remained indefinite until observed by Wigner or someone else.

‘Physicists of the time called this the paradox of Wigner’s Friend,’ Jasoft said. ‘It leads to an infinite regress, sometimes called a von Neumann catastrophe. The box-cat-friend system remains indefinite until observed, say by me. But then a new system is set up - box-cat-friend-me - which itself remains indefinite until observed by a third person, and so on.’

The Qax pondered for a while. ‘So we have, in human eyes, the central paradox of existence, of quantum physics, as set out by this Wigner and his chatter of cats and friends.’

‘Yes.’ Jasoft consulted his slate. ‘Perhaps external reality is actually created by the act of observation. Without consciousness, Schrödinger wondered, “Would the world have remained a play before empty benches, not existing for anybody, thus quite properly not existing?”’

‘Well, Jasoft. And what does this tell us about the mindset of those who style themselves the Friends of Wigner?’

Parz shrugged. ‘I’m sorry, Governor. I’ve no hypothesis.’

There was a lengthy silence then; Parz peered through the port of the flitter at the unblinking eye of the Spline.

Suddenly there was motion at the edge of Parz's vision. He shifted in his seat to see better.

The Spline freighter was changing. A slit perhaps a hundred yards long had opened up in that toughened epidermis, an orifice that widened to reveal a red-black tunnel, inviting in an oddly obscene fashion.

'I need your advice and assistance, Ambassador,' the Governor said. 'You will be brought into the freighter.'

Anticipation, eagerness surged through Parz.

The flitter nudged forward. Parz strained against his seat restraints, willing the little vessel forward into the welcoming orifice of the Spline.

The flitter passed through miles, it seemed, of unlit, fleshy passages; vessels bulging with some blood-analogue pulsed, red, along the walls. Tiny, fleshy robots - antibody drones, the Governor called them - swirled around the flitter as it travelled. Parz felt claustrophobic, as if those blood-red walls might constrict around him; somehow he had expected this aspect of the Spline to be sanitized by tiling and bright lights. Surely if this vessel were operated by humans such modifications would be made; no human could stand for long this absurd sensation of being swallowed, of passing along a huge digestive tract.

At last the flitter emerged from a wrinkled interface into a larger chamber - the belly of the Spline, Parz instantly labelled it. Light globes hovered throughout the interior, revealing the chamber to be perhaps a quarter-mile wide; distant, pinkish walls were laced with veins.

Emerging from the bloody tunnel into this strawberry-pink space was, Parz thought, like being born.

At the centre of the chamber was a globe of some brownish fluid, itself a hundred yards wide. Inside the globe, rendered indistinct by the fluid, Parz could make out a cluster of machines; struts of metal emerged from the machine cluster and were fixed to the Spline's stomach wall, so anchoring the globe. A meniscus of brownish scum surrounded the globe. The fluid seemed to be slowly boiling, so that the meniscus was divided into thousands, or millions, of hexagonal convection cells perhaps a hand's-breadth across; Parz, entranced, was reminded of a pan of simmering soup.

At length he called: 'Governor?'

'I am here.'

The voice from the flitter's translator box, of course, gave no clue to the location of the Governor; Parz found himself scanning the stomach chamber dimly. 'Where are you? Are you somewhere in that sphere of fluid?'

The Qax laughed. 'Where am I indeed? Which of us can ask that question with confidence? Yes, Ambassador; but I am not *in* the fluid, nor am I *of* the fluid itself.'

'I don't understand.'

'Turbulence, Parz. Can you see the convection cells? There am I, if "I" am anywhere. Do you understand now?'

Jasoft, stunned, stared upwards.

The home planet of the Qax was a swamp.

A sea, much like the primaeval ocean of Earth, covered the world from pole to pole. Submerged volcano mouths glowed like coals. The sea boiled: everywhere there was turbulence, convection cells like the ones Parz saw in the globe at the heart of the Spline.

'Parz, turbulence is an example of the universal self-organization of matter and energy,' the Qax said. 'In the ocean of my world the energy generated by the temperature difference between the vulcanism and the atmosphere is siphoned off, organized by the actions of turbulence into billions of convection cells.

'All known life is cellular in nature,' the Governor went on. 'We have no direct evidence, but we speculate that this must apply even to the Xeelee themselves. But there seems to be no rule about the form such cells can take.'

Parz scratched his head and found himself laughing, but it was a laughter of wonder, like a child's. 'You're telling me that those convection cells are the basis of your being?'

'To travel into space I have been forced to bring a section of the mother ocean with me, in this Spline craft; a small black hole at the centre of the Spline sets up a gravity field to maintain the integrity of the globe, and heaters embedded at the core of the fluid simulate the vulcanism of the home sea.'

'Not too convenient,' Parz said dryly. 'No wonder you need a Spline freighter to travel about in.'

'We are fragile creatures, physically,' the Governor said. 'We are easily disrupted. There are severe constraints on the manoeuvrability of this

freighter, if my consciousness is to be preserved. And there are comparatively few of us compared to, say, the humans.'

'Yes. There isn't much room, even in a planet-wide sea ...'

'The greatest of us span miles, Parz. And we are practically immortal; the convection cells can readily be renewed and replaced, without degradation of consciousness ... You will understand that this information is not to be made available. Our fragility is a fact which could be exploited.'

This warning sent a chill through Parz's old bones. But his curiosity, drinking in knowledge after years of exclusion, impelled him to ask still more questions. 'Governor, how could the Qax ever have got off the surface of their planet and into space? You're surely not capable of handling large engineering projects.'

'But we are nevertheless a technological race. Parz, my awareness is very different from yours. The scales are different: I have sentience right down to the molecular level; if I wish, my cells can operate as independent factories, assembling high technology of a miniaturized, biochemical nature. We traded such items among ourselves for millions of years, unaware of the existence of the rest of the universe.

'Then we were "discovered"; an alien craft landed in our ocean, and tentative contact was established—'

'Who was it?'

The Governor ignored the question. 'Our biochemical products had enormous market value, and we were able to build a trading empire - by proxy - spanning light-years. But we must still rely on clients for larger projects—'

'Clients like humans. Or like the Spline, who cart you around in their bellies.'

'Few of us leave the home world. The risks are too great.'

Parz settled back in his chair. 'Governor, you've known me for a long time. You must know how I've been driven crazy, for all these years, by knowing so little about the Qax. But I'm damn sure you haven't shown me all this as a long-service reward.'

'You're correct, Ambassador.'

'Then tell me what you want of me.'

The Governor replied smoothly, 'Parz, I need your trust. I want access to the future. I want humans to build me a new time Interface. And I want

you to direct the project.'

It took Parz a few minutes to settle his churning thoughts. 'Governor, I don't understand.'

'The revival of the ancient exotic matter technologies should not be difficult, given the progress of human science in the intervening millennium and a half. But the parameters will differ from the first project ...'

Parz shook his head. He felt slow, stupid and old. 'How?'

Through the flitter's tabletop the Qax transmitted an image to Parz's slate: an appealing geometrical framework, icosahedral, its twenty sides rendered in blue and turning slowly. 'The new Interface must be large enough to permit the passage of a Spline freighter,' the Governor said. 'Or some other craft sufficiently large to carry Qax.'

A traveller through a wormhole interface suffered gravitational tidal stresses on entering the exotic-matter portal framework, and on passing through the wormhole itself. Parz had been shown, now, that a Qax was far more vulnerable to such stress than a human. 'So the throat of the wormhole must be wider than the first,' he mused. 'And the portals must be built on a larger scale, so that the exotic-matter struts can be skirted—'

Parz touched the slate thoughtfully; the geometrical designs cleared.

The Qax hesitated. 'Parz, I need your co-operation on this project.' There seemed to be a note of honesty, of real supplication, in the Governor's synthesized voice. 'I have to know if this will cause you difficulty '

Parz frowned. 'Why should it?'

'You are a collaborator,' the Qax said harshly, and Parz flinched. 'I know the ugliness that word carries, for humans. And now I am asking you to *collaborate* with me on a project whose success may cause great symbolic damage to humans. I am aware of how much the small success of the time-journeying rebels has meant to humans, who see us as oppressive conquerors—'

Parz smiled. 'You *are* oppressive conquerors.'

'Now, though, I am asking you to subvert this emblem of human defiance to the needs of the Qax. I regard this as an expression of great trust. Yet, perhaps to you this is the vilest of insults.'

Parz shook his head, and tried to answer honestly - as if the Qax were an externalization of his own conscience, and not a brooding conqueror who

might crush him in an instant. ‘I have my views about the Qax Occupation, my own judgements on actions you have taken since,’ he said slowly. ‘But my views won’t make the Qax navies go away, or restore the technologies, capabilities and sheer damn dignity which you have taken from us.’

The Qax said nothing.

‘I am a practical man. I was born with a talent for diplomacy. For mediation. By doing the job I do, I try to modify the bleak fact of Qax rule into a livable arrangement for as many humans as possible.’

‘Your fellows might say that by working with us you are serving only to perpetuate that rule.’

Parz spread his age-marked hands, finding time to wonder that he was speaking so frankly with a Qax. ‘Governor, I’ve wrestled with questions like this for long hours. But, at the end of it, there’s always another problem to address. Something urgent, and practical, which I can actually do something about.’ He looked up at the ball of slowly seething liquid. ‘Does that make any sense?’

‘Jasoft, I think we are of like mind, you and I. That is why I chose you to assist me in this enterprise. I fear that the precipitate actions of these rebels, these Friends of Wigner, represent the gravest peril - not just to the Qax, but perhaps to humanity as well.’

Parz nodded. ‘That thought’s occurred to me too. Meddling with history isn’t exactly a proven science ... and which of us would wish to trust the judgement of these desperate refugees?’

‘Then you will help me?’

‘Governor, why do you want to travel *forward* in time? How will that help you with your problem from the past?’

‘Don’t you see what an opportunity this technology represents? By constructing a portal to the future I can consult with an era in which the problem *has already been addressed and resolved*. I need not make a decision on this momentous matter with any uncertainty about the outcome; I can consult the wisdom of those future Qax and refer to their guidance ...’

Parz wondered vaguely if some sort of time paradox would be invoked by this unlikely scheme. But aloud he said, ‘I understand your intention, Governor. But - are you sure you want to do this? Would it not be better to make your own decisions, here and now?’

The Governor’s interpreted voice was smooth and untroubled, but Parz fancied he detected a note of desperation. ‘I cannot take that risk, Parz. Why, it’s entirely possible I will be able to consult myself ... a self who knows what to do. Will you help me?’

The Qax is out of its depth, Parz realized. *It genuinely doesn’t know how to cope with this issue; the whole of this elaborate new Interface project, which will absorb endless energy and resources, is all a smokescreen for the Governor’s basic lack of competence*. He felt a stab of unexpected pride, of chauvinistic relish at this small human victory.

But then, fear returned through the triumph. He had been honest with the Governor ... Could he really bring himself to trust the judgement of these Friends of Wigner, to whom accident had provided such power?

And, surely, this victory of procrastination would increase the likelihood that they’d all be left helpless in the face of the wave of unreality from the past.

But, Parz reflected, he had no choices to make.

‘I’ll help you, Governor,’ he said. ‘Tell me what we have to do first.’

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4

With her message to Michael Poole dispatched and still crawling over the Solar System at mere lightspeed, Miriam Berg sat on coarse English grass, waiting for the Wigner girl, Shira.

Berg had built a time machine and carried it to the stars. But the few days of her return through the wormhole to her own time had been the most dramatic of her life.

Before her the lifeboat from the *Cauchy* lay in a shallow, rust-brown crater of scorched soil. The boat was splayed open like some disembowelled animal, wisps of steam escaping its still-glowing interior; the neat parallel slices through its hull looked almost surgical in their precision, and she knew that the Friends had taken particular pleasure, in their own odd, undemonstrative way, in using their scalpel-like cutting beams to turn drive units into puddles of slag.

The - murder - of her boat by the Friends had been a price worth paying, of course, for getting her single, brief message off to Poole. He would do something; he would be coming ... Somehow, in formulating her desperate scheme, she had never doubted that he would still be alive, after all these years. But still, she felt a twinge of conscience and remorse as she surveyed the wreckage of the boat; after all this was the destruction of her last link with the *Cauchy*, with the fifty men, women and Friends with whom she had spent a century crossing light-years and millennia - and who were now stranded on the far side of the wormhole in the future they had sought so desperately to attain, that dark, dehumanized future of the Qax Occupation.

How paradoxical, she thought, to have returned through the wormhole to her own time, and yet to feel such nostalgia for the future.

She lay on her back in the grass and peered up at the salmon-pink clouds that marbled the monstrous face of Jupiter. Tilting her head a little she could still make out the Interface portal - the wormhole end which had been left in Jovian orbit when the *Cauchy* departed for the stars, and through which this absurd earth-craft of the Friends of Wigner had come plummeting through time. The portal, sliding slowly away from the earth-craft on its neighbouring orbit, was a thumbnail sketch rendered in cerulean blue against the cheek of Jupiter. It looked peaceful - pretty, ornamental.

The faces of the tetrahedron, the junctions of the wormhole itself, were misty, puzzled-looking washes of blue-gold light, a little like windows.

It was hard to envisage the horrors which lay only subjective hours away on the other side of that space-time flaw.

She shivered and wrapped her arms around her body. After she'd landed on the earth-craft the Friends had given her one of their flimsy, one-piece jumpsuits; she was sure it was quite adequate for this fake climate, but, damn it, she just didn't feel warm in it. But she suspected she'd feel just as shivery in the warmest clothing; it wasn't the cold that was her problem, she suspected, but a craving to return to the safe metal womb that the *Cauchy* had become. During her century of flight, whenever she had envisaged the end of her journey, she had anticipated a pleasurable tremor on stepping out of a boat for the first time and drinking in the fresh, blue air of Earth ... even an Earth of the distant future. Well, she hadn't got anywhere near Earth; and surely to God anybody would be spooked by a situation like this. To be stranded on a clod of soil a quarter-mile wide - with no enclosing bubble or force shell as far as she could tell - a clod which had been wrenched from the Earth and hurled back through time and into orbit around Jupiter—

She decided that a healthy dose of fear at such a moment was quite the rational response.

She heard footsteps, rustling softly through the grass.

'Miriam Berg.'

Berg raised herself on her elbows. 'Shira. I've been waiting for you.'

The girl from the future sounded disappointed. 'I trusted you, Miriam. I gave you the freedom of our craft. Why did you send this message?'

Berg squinted up at Shira. The Friend was tall - about Berg's height, a little under six feet - but there the similarity ended. Berg had chosen to be AS-frozen at physical age around forty-five - a time when she had felt most at home in herself. Her body was wiry, tough and comfortable; and she liked to think that the wrinkles scattered around her mouth and brown eyes made her look experienced, humorous, fully human. And her cropped hair, grizzled with grey, was nothing to be ashamed of. Shira, by contrast, was aged about twenty-five. Real age, soon to be overwhelmed by time, thanks to the Qax's confiscation of the AS technology. The girl's features were delicate, her build thin to the point of scrawny. Berg couldn't get used to Shira's clean-shaven scalp and found it hard not to stare at the clean lines of

her skull. The girl's skin was sallow, her dark-rimmed eyes blue, huge and apparently lashless; her face, the prominent teeth and cheekbones, was oddly skeletal - but not unpretty. Shira was much as Berg imagined Earthbound city-dwellers of a few centuries before Berg's own time must have looked: basically unhealthy, surviving in a world too harsh for humans.

Berg would have sworn that she had even spotted fillings and yellowed teeth embedded in Shira's jaw. Was it possible that dental caries had returned to plague mankind again, after all these centuries?

What a brutal testament to the achievements of the Qax Occupation forces, Berg reflected bitterly. Shira was like a creature from Berg's past, not her future. And, now that Berg was deprived of the medical facilities of the *Cauchy* - not to mention AS technology - no doubt soon she, too, would become afflicted by the ills that had once been banished. My God, she thought; I will start to age again.

She sighed. She was close to her own time, after all; maybe - unlikely as it seemed - she could get back home. If Poole made it through ...

'Shira,' she said heavily, 'I didn't want to make you unhappy. I hate myself for making you unhappy. All right? But when I learned that you had no intention of communicating with the humans of this era - of my era - of telling them about the Qax ... then of course I had to oppose you.'

Shira was unperturbed; she swivelled her small, pretty face to the wreck of the boat. 'You understand we had to destroy your craft.'

'No, I don't understand that you had to do that. But it's what I expected you to do. I don't care. I achieved my purpose; I got my message off despite all of you.' Berg smiled. 'I'm kind of pleased with myself for improvising a radio. I was never a hands-on technician, you know—'

'You were a physicist,' Shira broke in. 'It's in the history books.'

Berg shivered, feeling out of time. 'I *am* a physicist,' she said. She got stiffly to her feet and wiped blades of grass from her backside. 'Can we walk?' she asked. 'This place is depressing me.'

Berg, casting about for a direction, decided to set off for the lip of the earth-craft; Shira calmly fell into step beside her, bare feet sinking softly into the grass.

Soon they were leaving behind whatever gave this disc of soil its gravity; the ground seemed to tilt up before them, so that it was as if they

were climbing out of a shallow bowl, and the air started to feel thin. About thirty feet short of the edge they were forced to stop; the air was almost painfully shallow in Berg's lungs, and even felt a little colder.

At the edge of the world tufts of grass dangled over emptiness, stained purple by the light of Jupiter.

'I think we have a basic problem of perception here, Shira,' Berg said, panting lightly. 'You ask why I betrayed your trust. I don't understand how the hell a question like that has got any sort of relevance. Given the situation, what did you expect me to do?'

The girl was silent.

'Look at it from my point of view,' Berg went on. 'Fifteen hundred years after my departure in the *Cauchy* I was approaching the Solar System again ...'

As the years of the journey had worn away, the fifty aboard *Cauchy* had grown sombrely aware that the worlds they had left behind were aging far more rapidly than they were; the crew were separated from their homes by growing intervals of space and time.

They were becoming stranded in the future.

... But they carried the wormhole portal. And, they knew, through the wormhole only a few hours' flight separated them from the era of their birth. It was a comfort to imagine the worlds they had left behind on the far side of the spacetime bridge, still attached to the *Cauchy* as if by some umbilical of stretched spacetime, and living their lives through at the same rate as the *Cauchy* crew, patiently waiting for the starship to complete its circuit to the future.

At last, after a subjective century, the *Cauchy* would return to Jovian orbit. Fifteen centuries would have worn away on Earth. But still their wormhole portal would connect them to the past, to friends and worlds grown no older than they had.

'I don't know what I was expecting exactly as we neared Sol,' Berg said. 'We'd run hundreds of scenarios, both before and during the journey, but we knew it was all guesswork; I guess inside I was anticipating anything from radioactive wastelands, to stone axes, to gods in faster-than-light chariots.

'But what I'd never anticipated was what we found. Earth under the thumb of super-aliens nobody has even seen ... and look what came hurtling

out to meet us, even before we'd got through the orbit of Pluto.' She shook her head at the memory. 'A patch of Earth, untimely ripp'd from England and hurled into space; a few dozen skinny humans clinging to it desperately.'

She remembered venturing from the steel security of the *Cauchy* into Jovian space, an envoy in her solo lifeboat, and tentatively approaching the earth-craft; she had scarcely been able to believe her eyes as the ship had neared a patch of countryside that looked as if it had been cut out of a tourist catalogue of Earth and stuck crudely onto the velvet backdrop of space. Then she had cracked the port of the boat on landing, and had stepped out onto grass that rustled beneath the tough soles of her boots ...

For a brief, glorious few minutes the Friends had clustered around her in wonder.

Then Shira had come to her - related fifteen centuries of disastrous human history in as many minutes - and explained the Friends' intentions.

Within a couple of hours of landing Berg had been forced to crouch to the grass with the rest as the earth-craft plummeted into the gravity tube that was the wormhole. Berg shuddered now as she remembered the howling radiation which had stormed around the fragile craft, the ghastly, mysterious dislocation as she had travelled through time.

She hadn't been allowed to get a message off to the crew of the *Cauchy*. Perhaps her *Cauchy* shipmates were already dead at the hands of the Qax - if that word 'already' had any meaning, with spacetime bent over on itself by the wormhole.

'It has been an eventful few days,' she said wryly. 'As a welcome home this has been fairly outrageous.'

Shira was smiling, and Berg tried to focus. 'I'm glad you say that: *outrageous*,' Shira said. 'It was the very outrageousness of the idea which permitted us to succeed under the eyes of the Qax, as we planned. Come, let us talk; we have time now.'

They turned and began to stroll slowly back down the rim-hill and towards the interior of the craft. As they walked, Berg had the uncomfortable feeling that she was descending into and climbing out of invisible dimples in the landscape, each a few feet wide and perhaps inches shallow. But the land itself was as flat as a tabletop to the eye. She was experiencing unevenness in the field which held her to this quarter-mile disc

of soil and rock; whatever they used to generate their gravity around here clearly wasn't without its glitches.

Shira said, 'You must understand the situation. We knew, from surviving records of your time, that your return to the Earth with the Interface portal was imminent. If you had succeeded, a gateway to the free past might have become available to us. We conceived the Project—'

Berg looked at her sharply. 'What Project?'

Shira ignored the question. 'The Qax authorities were evidently unaware of your approach, but clearly, once they detected your vessel and its unique cargo, you would be destroyed. We had to find a way to meet you before that happened.

'So, Miriam. We had to build a space vessel, and in the full and knowing gaze of the Qax.'

'Yeah. You know, Shira, we're going to have to sort out which tense to use here. Maybe we need to invent a whole new grammar - future past, uncertain present ...'

Shira laughed unselfconsciously, and Berg felt a little more human warmth for her.

They walked through a grove of light-globes. The globes, hovering in the air perhaps ten feet from the soil, gave out sun-like heat and warmth, and Berg paused for a few moments, feeling on her face and in her newly aging bones the warmth of a star she had abandoned a subjective century before. In the yellow-white light of the globe the flesh-pink glow of Jupiter was banished, and the grass looked normal, wiry and green; Berg ran a slippered toe through it. 'So you camouflaged your ship.'

'The Qax do not interfere with areas they perceive as human cultural shrines.'

'Hurrah for the Qax,' said Berg sourly. 'Perhaps they're not such bad fellows after all.'

Shira raised the ridges from which her eyebrows had been shaved. 'We believe that this is not altruism but calculation on the part of the Qax. In any event the policy is there - and it is a policy which may be manipulated to our gain.'

Berg smiled, her mind full of a sudden, absurd image of rebels in grimy jumpsuits burrowing like moles under cathedrals, pyramids, the concrete tombs of ancient fission reactors. 'So you built your ship under the stones.'

‘Yes. More precisely, we readied an area of land for the flight.’

‘Where did you get the resources for this?’

‘The Friends of Wigner have adherents System-wide,’ Shira said. ‘Remember that by the time of the first encounter with the Qax, humans had become a starfaring species, able to command the resources of multiple systems. The Qax control us - almost completely. But in the small gap left by that “almost” there is room for great undertakings ... projects to match, perhaps, the greatest works of your own time.’

‘I wouldn’t bet on that,’ Berg said with grim confidence.

They walked on, towards the heart of the craft. ‘So,’ said Berg, ‘you got your ship ready. How did you get it off the planet and into space?’

‘A stolen Squeem hyperdrive device,’ said Shira. ‘It cast a lenticular field around the craft, initially isolating it - and a surrounding layer of air - from the planet. Then the drive was used to hurl the craft into space, to bring it to the vicinity of your *Cauchy*. Then - after the rendezvous with your ship - the drive was used to carry the craft through the Interface.’

‘The Squeem. That’s the race humans came up against earlier, right? Before the Qax.’

‘And who, in their defeat, afforded us much of the basic technology we needed to get out of the Solar System.’

‘How will we defeat them?’

Shira grinned. ‘Read your history books.’

‘So,’ Berg said, ‘is the Squeem drive operating now?’

‘Minimally. It serves as a radiation screen.’

‘And to keep the air stuck to the ship, right?’

‘No, the craft’s gravity does that.’

Berg nodded; maybe here was a chance to get a little more meaningful information. ‘Artificial gravity? Things have come a long way since my day.’

But Shira only frowned.

They approached the dwellings and workplaces of the Friends. The buildings, simple cubes and cones built on a human scale, were scattered around the heart of this landscape ship like toys, surrounding the old stones at the centre of the disc. The building material was uniformly dove-grey and - when Berg ran her fingertips over the wall of a tepee as she passed - smooth to the limit of sensation. But it was human-warm, without the cold

of metal. This was ‘Xeelee construction material’, one of the many technological miracles which had apparently seeped down to mankind - and their foes, like the Squeem and the Qax - from the mysterious Xeelee, lords of creation.

Friends moved among the buildings, patiently going about their business. One small group had collected around one of the data capture devices they called ‘slates’, and were arguing over what looked like a schematic of the earth-craft.

They nodded to Shira, and to Berg with glances of curiosity.

Berg had counted about thirty Friends of Wigner aboard the craft, roughly split between male and female. They appeared to be aged between twenty-five and thirty, and all seemed healthy and intelligent. Obviously this crew had been selected by the wider Friends organization for their fitness for the mission. All followed the shaved-skull fashion of Shira - some, Berg had noticed with bemusement, had indeed removed their eyelashes. But they were surprisingly easy to distinguish from each other; the shape of the human skull was, she was learning, as varied - and could be as appealing to the eye - as the features of the face.

‘You’ve done well to get so far,’ Berg said.

‘More than well,’ said Shira coolly. ‘Our craft has successfully traversed the portal, without significant damage or injury. Our supplies - and our recycling gear - should suffice to sustain us in this orbit around Jupiter for many years. Long enough for our purposes.’ She smiled. ‘Yes, we have done well.’

‘Yeah.’ Berg sourly studied the busy knots of Friends. ‘You know, it might help me a lot to understand you if you told me what the hell your Project is all about.’

Shira studied her sadly. ‘That would not be appropriate.’

Berg took a stance before her, hands on hips, and set her face into what she knew would be a commanding scowl. ‘Don’t hide behind platitudes, Shira. Damn it all to hell, it was my ship - my Interface - which you used to get as far as you have. And it’s the lives of my crew, lost on the wrong side of the wormhole, which have paid for the success you so complacently report. So you owe me a bit more than that patronizing crap.’

Shira’s pretty, paper-fine face creased with what looked like real concern. ‘I’m sorry, Miriam. I’m not meaning to patronize you. But I - we -

genuinely believe that it wouldn't be right to tell you.'

'Why? At least tell me that much.'

'I can't. If you understood the Project then you would also see why you can't be told any more.'

Berg laughed in her face. 'Are you kidding me? Is that supposed to satisfy me?'

'No,' Shira said, grinning almost cheekily, and again, for a moment, Berg felt a tug of genuine empathy with this strange, secret person from the other side of time. 'But it really is all I can give you.'

Berg scraped her fingers across her wiry stubble of hair. 'What is it you're afraid of? Do you think that it's possible I'll oppose you - try to obstruct the Project?'

Shira nodded seriously. 'If you gained only partial understanding, then that is possible. Yes.'

Berg frowned. 'I don't think you're talking about understanding - but about faith. Even if I knew what you were up to, I might oppose it if I didn't share the same irrational faith in its success. Is that it?'

Shira did not reply to that; her gaze was clear and untroubled.

'Shira, maybe you genuinely need my help,' Berg said. 'I'd rather not rely on the faith that my ship is going to fly, if I've got a chance of getting into the drive and making sure it does.'

'It's not as simple as that, Miriam,' Shira said. She smiled disarmingly. 'And I wish you'd stop pumping me.'

Berg touched the girl's elbow. 'Shira, *we're on the same side*,' she said urgently. 'Don't you see that?' She gestured vaguely in the direction of the inner Solar System. 'You've got the resources of five planets - of Earth itself - to call on. Once people understood what you're trying to avert - the nightmare of the Qax Occupation - you would be given all the help the worlds could muster. You'd have the strength of billions.'

'It wouldn't work, Miriam,' Shira said. 'Remember, we have developed fifteen centuries beyond you. There is little your people could do to help.'

Berg stiffened, drawing away from the girl. 'We could pack a hell of a punch, Shira. What if the Qax follow us back in time, through the portal? Won't you need help to stave them off?'

'We can defend ourselves,' Shira said calmly.

That sent a shiver through Berg, but she pressed on: ‘Then imagine a hundred violently armed GUTships crashing through that portal, and into the future. They could do a hell of a lot of damage—’

Shira shook her head. ‘A single Spline warship could scythe them down in a moment.’

‘Then let’s use the advantage of the centuries we’ve gained.’ Berg slammed her fist into her palm. ‘There’s not a Qax alive at this moment who even knows humans exist. We could go and roast them in their nest. If you gave us the secret of the Squeem hyperdrive, we could build a faster-than-light armada and—’

Shira laughed delicately. ‘You’re so melodramatic, Miriam. So violent!’ She made a wide cage of her hands. ‘At this moment, the Qax already operate an interstellar trading empire spanning hundreds of star systems. The thought of an ill-equipped rabble of humans from fifteen centuries before my time having any hope of overcoming that might is risible, frankly. And, besides - we are not hyperdrive engineers. We could not “pass on the secrets” of the Squeem drive, as you put it.’

‘Then let our engineers take it apart.’

‘Any such attempt would result in the devastation of half a planet.’

Berg found herself bridling again. ‘You’re still being patronizing,’ she protested. ‘Even insulting. We’re not complete dummies, you know; we are your ancestors, after all. Maybe you ought to have more respect.’

‘My friend, your thinking is simplistic. We did not come here to attempt a simple military assault on the Qax. Even were it to succeed - which it could not - it would not be sufficient. Our purpose is at once more subtle - and yet capable of achieving much, much more.’

‘But you won’t tell me what it is? You won’t trust me. Me, your own great-to-the-nth grandmother—’

Shira smiled. ‘I would be proud to share some fraction of your genetic heritage, Miriam.’

Side by side they walked on, still heading towards the centre of the earth-craft. Soon they had cleared the belt of construction-material huts with their knots of busy people, and the hum of the Friends’ conversation faded behind them; when they reached the centre of the craft it was as if they were entering a little island of silence.

And as the two women walked into the broken circle of stones, that seemed entirely appropriate to Berg.

There were no globe-lights here; the stones, hulking and ancient, stood defiant in the smoky light of Jupiter. Berg stood beneath one of the still-intact sarsen arches and touched the cold blue-grey surface of a standing stone; it wasn't intimidating or cold, she thought, but friendly - more like stroking an elephant. 'You know,' she said, 'you could cause a hell of a stir just by landing this thing on Earth. Maybe on Salisbury Plain, a few miles from the original - which, of course, is standing there in the wind and the rain, in this time zone. If it were up to me, I couldn't resist it, Project or no Project.'

Shira grinned. 'The thought does have an appeal.'

'Yeah.' Berg walked towards the centre of the circle, stepping over crumbled fragments of rock. She turned slowly around, surveying the truncated landscape, trying to see this place through the eyes of the people who built it four thousand years earlier. How would this place have looked at the solstice, standing on the bare shoulders of Salisbury Plain, with no sign of civilization anywhere in the universe save a few scattered fires on the plain, soon dying in the dawn light?

... But now her horizon was hemmed in by the anonymous grey shoulders of the Friends' construction-material huts; and she knew that even if she had the power to blow those huts away she would reveal only a few hundred yards of scratched turf, a ragged edge dangling over immensities. And when she tilted her head back she could see the arc of Jupiter's limb, hanging like an immense wall across the universe.

The old stones were dwarfed by such grandeur. They seemed pathetic.

Absurdly she felt a lump rising to her throat. 'Damn it,' she said gruffly.

Shira stepped closer and laid her hand on Berg's arm. 'What is it, my friend?'

'You had no right to do it.'

'What?'

'To hijack these stones! This isn't their place; this isn't where they are meant to be. How could you murder all that history? Even the Qax never touched the stones; you said so yourself.'

'The Qax are an occupying power,' Shira murmured. 'If they thought it in their interest, they would grind these stones into dust.'

‘But they did not,’ Berg said, her jaw tight. ‘And one day, with or without you, the Qax would be gone. And the stones would still stand! - but for you.’

Shira turned her face up to Jupiter, her bare skull limned in salmon-pink light. ‘Believe me, we - the Friends - are not without conscience when it comes to such matters. But in the end, the decision was right.’ She turned to Berg, and Berg was aware of a disturbingly religious, almost irrational, aspect to the girl’s pale, empty blue eyes.

‘How do you know?’ Berg asked heavily.

‘Because,’ Shira said slowly, as if speaking to a child, ‘in the end, *no harm will have come to the stones*.’

Berg stared at her, wondering whether to laugh. ‘Are you crazy? Shira - you’ve burrowed under the stones, wrapped a hyperdrive field around them, ripped them off the planet, run them through the gauntlet of the Qax fleet, and thrown them fifteen hundred years back in time! What more can you do to them?’

Shira smiled, concern returning to her face. ‘You know I will not reveal our intentions to you. I can’t. But I can see you are concerned, and I want you to believe this, with all your heart. When our Project has succeeded, Stonehenge will not have been harmed.’

Berg pulled her arm away from the girl’s hand, suddenly afraid. ‘How is that possible? My God, Shira, what are you people intending to do?’

But the Friend of Wigner would not reply.

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5

The flitter nestled against the Spline's stomach lining; small, clawlike clamps extended from the flitter's lower hull and embedded themselves in hardened flesh.

Jasoft Parz, watching the anchoring manoeuvre from within the flitter, felt his own stomach turn in sympathy.

He ran rapid tests of the integrity of his environment suit - green-glowing digits scrolled briefly across his wide faceplate - and then, with a nod of his head, instructed the flitter's port to open. There was a hiss of equalizing pressure, a breeze which for a few moments whispered into the cabin, pushing weakly at Parz's chest. Then Parz, with a sigh, unbuckled his restraints and clambered easily out of his chair. Since the last time he'd visited the Governor inside his Spline flagship, back in Earth orbit a full year ago, the AS treatments had done wonders for some of his more obvious ailments, and it was a blessed relief to climb out of a chair without the accompaniment of stabbing agonies in his back.

Antibody drones had fixed a small, flat platform over the Spline's stomach lining close to the lip of the flitter's port; a compact translator box was fixed to it. Briskly, Parz pulled himself out of the flitter and activated electromagnets in the soles of his boots to pin his feet to the platform. Soon he was done, and was able to stand in a reasonably dignified fashion.

He looked around. The hull of the flitter, resting beside him, was like some undigested morsel in the gut of the Spline. He turned his face up to the ball of boiling fluid suspended above him; alongside it, shimmering in the murky gloom of the Spline gut, was a Virtual of the scene outside - the icosahedral wormhole portal, a sliver of Jupiter itself. 'Governor,' he said. 'It's been a long time.'

The Governor's voice sounded from the translator box, slightly muffled in Parz's ears by the thick air. 'Indeed. A full year since those damned Friends of Wigner absconded. A wasted year, as we've struggled to put right the situation. And now we reach the climax, here in the shadow of Jupiter, eh, Parz?'

'I wouldn't say wasted,' Parz said smoothly. 'The building and launch of the new Interface portals was a great success; I was astonished at the rapid progress made.'

‘Thank you for the part you played in that enterprise, Jasoft Parz.’

‘My actions weren’t for your benefit, in particular.’

‘Perhaps not,’ said the Qax. ‘But what does your motive avail me, if the result is as I required? I understand that your motive was your personal reward, the AntiSenescence treatment which—’

‘Not just that,’ Parz said coldly. ‘I happened to think that the revival of the old exotic-matter industries was a good thing for humans.’ It had not been without cost, of course. With the single-mindedness available only in a command society, most of the human worlds - Earth, Mars, Luna, Titan - had been transformed into little more than exotic-matter factories, all their resources dedicated to the single goal. But the completion of such a massive project based on purely human technology - even a project instigated by the Qax - had done a great deal for the self-esteem of the race. ‘After all, the damned thing was built and launched within six months, Governor.’

‘I understand your pride,’ the Governor said in its smoothly neutral feminine voice. ‘And I’m glad to see that time has not withered your outspoken tongue, Ambassador.’

Parz said sourly, ‘What is it you understand? Governor, you’ve underestimated us before, remember. The escape of the Friends—’

‘Must I bolster your pride, Jasoft?’ the Governor cut in. ‘I have invited you here to witness the triumph of our work together.’

And indeed, Parz conceded, the Qax had summoned him here to Jovian space as soon as the showers of high-energy particles had begun to erupt from the mouth of the waiting portal ... the first portents of an arrival from the future.

‘After all,’ the Qax went on, ‘if it were not for the granting of AS treatment to you and a handful of your colleagues - treatment you were not reluctant to accept - you would not be standing here now lecturing me about the awesome potency of the human race. Would you? For you were close to the termination of the usual human lifespan, were you not?’

The relaxed contempt brought the blood to Parz’s cheeks. ‘Governor—’

But the Qax went on impatiently, ‘Let us abandon this, Ambassador; on this day of days, let us dwell on our achievements together and not our differences.’

Parz took a deep breath of cool, blue human air. ‘All right, Governor.’

‘Your heart must have surged with pride when the new Interface was completed.’

Indeed it had, Parz remembered. At last the mouths of the Solar System’s second spacetime wormhole had been threaded with icosahedra of blue-glowing exotic matter. For a few brief, magnificent weeks, the twin portals had sailed together around Jupiter’s gravity well, the milky sheets of broken space stretched across the exotic-matter frames and glimmering like the facets of mysterious jewels.

Then had come the time for the removal of one of the portals. A massive GUTdrive vessel had been constructed: hovering over the portals the vessel had looked, Parz remembered, like a human arm, a clenched fist poised over a pair of fragile, blue-grey flowers.

The ship’s huge GUTdrive engines had flared into life, and one of the portals had been hauled away, first on a widening spiral path out of the gravity well of Jupiter, and then away on a shallow arc into interstellar space.

Parz - like the rest of the human race, and like the Governor and the rest of the Qax occupation force - had settled down to wait out the six months of the portal’s sublight crawl to its destination.

The first Interface ship, the *Cauchy*, had taken a century to bridge fifteen hundred years. The new ship took only half a year of subjective time to loop away from Sol and return; but, accelerating at multiples of Earth’s gravity, it had crossed five centuries into the future.

Parz was not a scientist, and - despite his close connection to the project - found much of the physics of wormholes philosophically baffling. But, as he had travelled to the Jovian system and had gazed on the slowly turning jewel that was the Qax’s returned icosahedral portal, the essence of the project had seemed very real to him.

On the other side of those misty, grey-blue planes was the future. If the Friends of Wigner had gained the advantage by escaping into a past in which no Qax had even heard of humankind, what greater advantage could those future Qax wield? Parz reflected ruefully. They had five centuries of hindsight, five centuries in which the outcome of the struggle between Qax and human had surely been decided one way or the other.

Only a year had passed since the escape of the Friends. Yet already those future Qax had the opportunity to twist events any way they pleased.

‘You are pensive,’ the Governor said, breaking into his thoughts.

‘I’m sorry.’

‘Come,’ the Qax said, its translator-box voice softly beguiling. ‘I don’t think either of us would describe the other as a friend, Ambassador. But we have worked closely, and - once - grew to be honest with each other. Tell me what concerns you, while we wait on events.’

Parz shrugged. ‘What an awesome weapon we have delivered into the hands of your successors, five centuries away. Imagine one of the great generals of human history - Bonaparte, for example - able to study, from history texts, the outcome of his greatest battle *before even taking the field*.’

‘There is more than one possibility, Jasoft. Such a general might feel rendered helpless by the weight of historical evidence. Many wars are not decided by strokes of military genius - or by the heroism of a few individuals - but by the forces of history. Or, perhaps, the general might even be stricken with remorse, at the suffering and death his ambition had caused; perhaps he would even work to avert his battle.’

Parz snorted. ‘Maybe. Although I can’t imagine any Qax “general” feeling much remorse for human victims of a tyranny or a war, regardless of the outcome. When we learned of the escape of the Friends of Wigner, remember that we both felt mistrust at such awesome power being delivered into the hands of any group, regardless of species. Should we not feel such mistrust of these Qax from the future?’

The Qax laughed softly. ‘Now perhaps it is you who underestimate us. I am not without admiration for human achievements, baffled though I am sometimes by your motives.’

Jasoft peered through his faceplate at the soft, soapy bubbling of the sea-fragment hosting the Governor. ‘For example?’

‘The craft which bore away our Interface terminal was manned by humans. The vessel was essentially automatic, of course - and certainly immune to any possibility of mutiny by the human crew - but your experience of centuries of spaceflight persuaded me that there is no better guarantee of the success of a human-built ship than the presence aboard her of human engineers, with their ingenuity and adaptability - both physical and mental. And so we needed a human crew.’

‘And you found no trouble getting volunteers. Despite the prospects of multiple-g travel.’ Parz smiled. ‘That isn’t so surprising, Governor.’

‘How so?’

‘Not all humans are the same. We are not all as comfortable with our client-race status as—’

‘As you, for example, Jasoft?’

‘Right.’ Parz stuck his chin out, feeling his stubbly jowls stretch; he didn’t expect the Qax to read the gesture, but the hell with it. ‘Correct. Not all humans are like me. Some want to get out of the box the Solar System has become, regardless of the cost. When will humans again be allowed to journey beyond the Solar System? And what’s life for, but to see, to explore, to wonder? Maybe taking away our AS technology was a mistake for you; maybe the renewed cheapness of our lives - a few, paltry decades and then the endless darkness - has made humans more reckless. Harder to control, eh, Governor?’

The Governor laughed. ‘Perhaps. Well, Parz; we should turn to our business. And how do you feel, now that the Interface is about to come into operation?’

Parz thought back over the long months of waiting after the construction and launch of the Interface. He had maintained a Virtual image of the stationary portal in his quarters throughout that time, listening to endless, baffling commentaries about relativistic time dilation, closed timelike curves and Cauchy horizons.

The future Qax must have been expecting the visitation from the past, of course. Perhaps some of the Qax alive in Parz’s time would still be conscious and able to remember the launch.

At last the day of the ship’s scheduled return to future Earth - the day on which the portal would begin to function as a time tunnel to the future - had come; and Parz had been joined in his silent vigil beneath Virtuals of the stationary Jovian icosahedron by an unseen congregation of millions. All over the Earth, and through the rest of the Occupied System, humans had watched the twinkling icosahedron with a mixture of fascination and dread.

Then, at last, the bursts of exotic particles from the wormhole terminus ...

‘I guess,’ Parz said slowly, ‘I feel something of what Michael Poole, the builder of the first Interface, must have gone through as he waited for his project to come to fruition.’ But that first Interface project had, as Parz understood it, been initiated in the hope of filching some knowledge from

future generations of mankind - and to test out the science of spacetime and exotic physics - and, Parz guessed, for the sheer, exuberant hell of it. A working time machine, in orbit around Jupiter? If you can build it, why the hell not?

Poole must have anticipated the opening of his wormhole with joy. Not feared it, as Parz had done.

'Yes,' the Qax said reflectively. 'And now—'

And now the Virtual image of the icosahedron exploded; darkness flecked with gold rained over Parz and he cried out, curled in on himself, cringing.

The Governor was silent; in Parz's ears there was only the ragged rasp of his own breath.

After long seconds Parz found the will to raise his head. The Virtual of the portal was still there, with the crack of Jovian light visible alongside it ...

But now, before the portal, hovered a single ship. A bolt of night-darkness had erupted through the blue-grey face of the portal. The surface of the spacetime discontinuity still quivered seconds after the passage, sending distorted echoes of Jupiter's pink glow over the Governor's bubbling globe of Qax ocean.

The ship from the future spread wings like a bird's, a hundred miles wide. Night-dark canopies loomed over Parz.

'I am awed, Qax,' Parz said, his voice a whisper.

'No less I. Parz, the grace of this ship, the use of the sheet-discontinuity drive - all characteristics of Xeelee nightfighter technology.'

Xeelee . . . Parz felt his fear transmute into an almost superstitious horror that suddenly Xeelee might be made aware of the existence of humanity.

'But this is a Qax ship, nevertheless,' the Governor said. 'I have received call signatures ... My successors must fare well in the centuries to come, to gain such an access to Xeelee technology.'

'You must be proud,' Parz said sourly. His heart still pounded, but already his fear was lapsing into irritation at the Qax's complacency.

'The wings are actual sheet-discontinuities in spacetime,' the Governor babbled on. 'Motive power for the ship is provided by a nonlinear shear of

spacetime - much as acoustical shock waves will propagate themselves through an atmosphere, once formed. And—’

‘Enough.’

Parz’s breath caught in his throat. The new voice, which had come booming from the translator box which rested on the platform beside him, was feminine; but where the Governor’s synthetic voice was breathless, shallow and fast-speaking, the new voice was deep and heavy, almost harsh.

The Governor said, almost girlishly, ‘I hear your voice. Who are you?’

‘I am Qax.’

The Governor said, ‘I do not recognize you.’

‘That should not surprise you. I travelled through the wormhole Interface from your future. I am not yet sentient in this local frame.’

‘Sir,’ Parz said, determined not to show any awe or fear, ‘I’ve got used to a Qax being laid out on the scale of miles, like the Governor and his fragment of mother-sea up there. But the body of your ship is much smaller. How can the awareness of a Qax be contained in such a constricted space?’

‘Many things will change in the coming centuries,’ the newcomer said. ‘Many Qax will die, and many more will be formed; very few of the Qax now sentient will survive. And the forms which support our sentience will become greatly more varied. No longer will the Qax be able to afford the luxury of the ancient aquatic form; the Qax, scattered across the stars, must find new ways to survive.’

Parz could scarcely believe the implications of these words. ‘Qax, what are you saying? What happens to the Qax? What is it that humans do to you?’

‘First answer my question,’ the Governor cut in, and Parz thought he could detect a note of aggrieved pride in the synthesized voice. ‘Why did you not inform me of your approach? And why do we converse through this human translator box? We are Qax. We are brothers. Our forms may differ, but surely we can still communicate as the Qax have always done?’

‘I want Jasoft Parz to hear and understand all that occurs here,’ the new Qax said. ‘Later, I will require his co-operation.’

Parz took an uneasy step back, feeling the edge of the metal platform under his feet. ‘You know me?’

Again, a primitive awe rose in him, threatening to overwhelm him, as if he were some savage confronted by a shaman. But how could a Qax from

five centuries into the future know of his existence? *But of course it does,* he thought, a touch of insanity bubbling in his thoughts. *The Qax is from the future; it knows everything about this sequence of events. It's probably watched this scene play itself out a dozen times . . .*

'Jasoft Parz, bear witness.'

Parz looked up.

Light, cherry-red, lanced through the hull of the Spline, a geometrically perfect line which pierced the heart of the Governor's ocean-globe. The flesh of the Spline peeled back from the wound, bubbling into immense blisters, and Parz was afforded a brief glimpse of space. The Virtual image of the nightfighter ship broke up into a cloud of pixels and vanished.

Jasoft closed his eyes, ran the last second of the Virtual scene through his mind.

The Qax ship, he realized. The weapon - the beam, whatever it was - had been fired by the Qax ship from the future.

'Xeelee technology, Jasoft Parz,' the new Qax said. 'The starbreaker ...'

Where the cherry-red beam had struck, the surface of the ocean-globe seethed and steamed; huge bubbles erupted from the heart of the liquid, disrupting the delicate pattern of hexagonal turbulence cells. Mist wrapped around the churning globe.

'My God,' Parz breathed. 'You're killing it.'

'The beam consists of coherent gravity radiation,' the new Qax said, almost conversationally. 'The form of the ocean fragment is maintained by a small black hole at its centre. The action of the weapon has caused the equilibrium of the globe to be broken; it is now imploding towards the central singularity.'

The ball of liquid above Parz's head was completely obscured by mist now; it was like standing under a fat, spherical cloud. Droplets of fluid, round and heavy as mercury, splashed obscenely against Parz's faceplate. He wiped at the plate with a gloved hand. 'Qax,' he said angrily, 'I didn't know your species murdered each other.'

'The failure of the one you called the Governor, in permitting the escape of these rebel humans through time, is so catastrophic as to be criminal. If it troubles you, Parz, think of this as a culling, not a murder. A strengthening of my species through the elimination of the weak. The Governor of Earth was - hesitant. I am not.'

‘A catastrophic failure?’ Parz knelt again and pressed his face close to the translator box, shouting to hear his own voice over a rising wind. ‘My God, Qax, I don’t know what I expected from the future, but nothing like this ... We humans terrify you. Don’t we, Qax?’

‘Yes,’ the Qax said simply. ‘But the fact of my apprehension should, perhaps, terrify *you*. For it is I, in this local frame, who wield the power—’

Parz shivered at that.

‘And I do not fear *you*, Jasoft Parz,’ the Qax went on.

Parz frowned. ‘How flattering.’

‘I have studied your earlier conversation with the Governor. This new policy, of permitting selected humans access to the ancient AS technology is indeed a wise one. Because it divides you. And you, Jasoft Parz, you have accepted the payment of the Qax. You live, while your fellows die like insects.’ The Qax laughed, and its synthesized laughter was dark, sinister in comparison with the Governor’s. ‘Your analysis of the value of potential immortality was valid. A human would far sooner throw away a life of a mere few decades than abandon the chance of immortality. Wouldn’t you, Parz?’

‘If you want my co-operation, why do you insult me?’

‘Oh, I will have your co-operation.’

Parz lifted his head, letting the ghastly rain slide over his faceplate. ‘You listen to me. The Governor, whom you seem to hold in such contempt, was *civilized*. Do you understand me? The framework within which we worked together - the Occupation - was not established by either of us. But the Governor strove for efficiency, not terror or brutality. And that was why I spent my life working with him; I felt it was the best way I could serve my species. But you. I’ve already seen you murder one of your own, since your irruption from the future only moments ago—’

The Qax laughed. ‘You are honest, Jasoft Parz; perhaps that is why the Governor valued your presence so much. Listen. My purpose here is not to maintain the Occupation.’

Parz asked uneasily: ‘Then what is it?’

‘I will not stay in this local spacetime frame. My intention is to pass through the original human portal - to move still further back into time.’

‘You’re chasing the Friends of Wigner, the human rebels, back through time?’

‘I intend to destroy those rebels, yes. And to achieve much more besides.’

Parz tried to imagine this Qax - an unprincipled killer with an admitted fear and loathing of humans - emerging into the unprepared Solar System of fifteen centuries earlier.

‘And me?’ Jasoft asked fearfully. ‘What will I do, while you launch this assault on the past?’

‘Why, you will accompany me, of course.’

‘Dear God—’ Primaeval ocean murk sleeted again over Jasoft’s faceplate; he wiped at it ineffectually with the back of one gloved hand.

The Qax said, ‘The Governor will remain conscious for some hours, although its sentience is diminishing already.’

‘Is there pain?’

‘Our business is concluded here. Return to your craft.’

Barely able to see through a sheen of ocean-stuff, Parz reached for the shelter of the flitter.

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6

The GUTship *Hermit Crab* swept backside-first through a powered orbit around the swollen cheek of Jupiter.

Michael Poole sat in the *Crab*'s clear-walled lifedome with the Virtual of his father, Harry. The ship was rounding the dark side of the planet now, and the GUTdrive, blazing a mile beneath the transparent floor of the cabin, illuminated vast areas of an ocean of swirling cloud. Violet light was cast upwards through the cabin, and Poole noticed how his father's young, blond head had been given suitably demonic shadows by the processors in response.

'We're making quite an entrance,' Harry said.

'I guess so. If you like fireworks.'

Harry turned to his son, his blue eyes boyishly wide with wonder. 'No, it's more than that. You're the physicist, son, and I'm just a government functionary; and you understand it all better than I ever could. But maybe the wonder of it doesn't hit you with the same impact as it does a layman like me. We're harnessing forces lost to the universe since the first few seconds after the Big Bang—'

'Essentially. Except that you're talking about the first few *fractions* of a second ...'

'GUT' stood for 'Grand Unified Theory', the philosophical system which described the fundamental forces of nature as aspects of a single superforce. The heart of the *Crab*'s GUTdrive was a fist-sized chunk of hydrogen locked into a superconducting bottle and bombarded to creation physics temperatures. At such temperatures only the unified superforce could act. When hydrogen was bled from the bottle the superforce went through 'phase transitions', decomposing into the four familiar forces of nature - strong and weak nuclear, gravitational and electromagnetic.

And, just as steam releases heat when it goes through a phase transition by condensing to water, so at each transition of the superforce a pulse of energy was emitted.

Poole said to his father, 'The *Crab* uses GUT phase energy to flash comet ice to plasma; the superheated plasma is expelled through a superconducting nozzle ...'

Harry nodded, peering down the mile of superstructure to the residual lump of comet which had brought them in from the Oort Cloud. ‘Sure. But it was that same phase transition energy, liberated during the cooling period after the Big Bang, which drove the expansion of the universe itself.

‘That’s what seems so awesome, when you stop and think about it, Michael. We’ve spent a year scooting around the Solar System - and now we’re making Jupiter himself cast a shadow - and we’re doing it by harnessing the energies of creation itself. Doesn’t it make you wonder?’

Poole rubbed the side of his nose. ‘Yes, Harry. Of course it does. But I don’t actually think that sort of attitude is going to help us all that much, in the next few days. I’d rather not feel awed by the workings of our own drive, right now. Remember we’re going to be dealing with humans from fifteen centuries into the future ... or for all I know, with artificial life forms, or with aliens, even.’

Harry leaned closer to Poole and grinned. ‘Not all of us AI are such terrible things, Michael.’

Poole narrowed his eyes. ‘Push your luck and I’ll pull your plug.’

Harry grumbled, ‘Maybe these superpeople from the future will be advanced enough to recognize the rights of AIs. Such as the right to continuous consciousness, for instance. Anyway, I know it’s all talk.’

‘If you don’t get your fingers out of my head then I’ll shut you down, talk or not, you old fart.’

An alarm chimed through the lifedome. The *Crab*, sailing barely a thousand miles over a sea of purple clouds, was near its closest approach to the planet; and now the battered old ship swept around the limb of Jupiter and emerged into the light of the distant sun. Sol, shrunken by distance, lifted its rays through layers of cloud at Jupiter’s flat-infinite horizon; there was a dazzling impression of the depth of the Jovian atmosphere as clouds cast thousand-mile-long shadows over each other. The cabin was flooded with brilliance. For a second Harry’s Virtual image retained the purplish shadows cast from the cabin floor by the drive. Then the processor caught up and when Harry turned his face to the sun his profile was highlighted in yellow.

Then, like the rise of a second, angular sun, the Interface portal hurtled over the horizon towards them. Michael could see the firefly sparks of ships circling the portal, waiting for any new intrusion from the future. The

Crab's trajectory took her to within a few dozen miles of the portal; Michael stared out at the dazzling sky-blue of the portal's exotic tetrahedral frame, let his eyes linger over those cool lines and be drawn effortlessly to the geometrically perfect vertices. The faces were like semitransparent panes of silvered glass; he could make out the watercolour oceans of Jupiter through the faces, but the cloud images were overlaid with a patina of silver-gold and were distorted, they swirled around in a fashion the eye could not quite track, like visions in a dream. And every few seconds a face would abruptly clear, just for a dazzling moment, and afford Michael a glimpse of another space, unfamiliar stars, like a hole cut into Jupiter.

The *Crab* swept on and away from the artifact; it dwindled rapidly behind them like an abandoned toy.

'My God,' Harry breathed. 'I didn't know how beautiful it was. I thought I could see stars in those faces.'

'You could, Harry,' Poole said softly. 'It really is a gateway to another time, another place.'

Harry leaned towards Michael. 'I'm very proud of you.'

Poole stiffened and pulled away.

Harry said, 'Listen, what do you really think we're going to find out here?'

'Aboard the craft from the future?' Poole shrugged. 'Since they haven't communicated with us apart from that single message from Miriam when they came through the Interface a year ago, it's difficult even to extrapolate.'

'Will humans still be recognizably human, do you think?'

Poole swivelled a glare at Harry. 'And are we "recognizably human"? Look at us, Harry; I'm an AS-immortal, and you're a semi-sentient AI.'

'*Semi*-sentient?'

'Superficially we look human enough, and we'd probably claim to be human, but I don't know if a man of, say, a thousand years ago would recognize us as members of the same species as himself. And now we're talking another fifteen centuries down the road ...'

Harry wiggled his fingers in the air, pulling a face. 'A third arm growing out of the centre of the face. Disembodied heads, bouncing around on the deck like footballs. What do you think?'

Poole shrugged. ‘If gross modifications like that are efficient, or serve a purpose, then maybe so. But I don’t think any of that matters a damn, compared to what’s going on *inside* their heads. And what they’ve built.’

‘What about technology?’

‘I guess I’d put singularity physics a long way up the list,’ Poole said. ‘The manipulation of spacetime curvature . . . We’ve already got a mastery of high-density, high-energy physics - that’s the heart of the GUTdrive, and of the exotic matter which the Interface portals were built of.’

‘And in fifteen more centuries—’ Harry prompted.

‘How far could we take this? I’d anticipate the manufacture of singularities themselves, on the scale of a few tons up to, maybe, asteroid masses.’

‘What for?’

Poole spread his hands wide. ‘Compact power sources. If you had a black hole in your kitchen you could just throw in the waste and see it compressed to invisibility in a fraction of a second, releasing floods of usable short-wavelength radiation. And how about artificial gravity? Bury a black hole at the centre of, say, Luna, and you could raise the surface gravity as high as you like.’

Harry nodded. ‘Of course you’d have to find some way of keeping the singularity from eating the Moon.’

‘Yeah. Then there are gravity waves, to be generated by colliding black holes. You could build tractor beams, for instance.’ Poole settled back into his couch and closed his eyes. ‘Of course, if they’ve taken this far enough, maybe they will have found some use for naked singularities.’

‘And what’s a naked singularity?’

‘ ... Maybe we’re going to find out.’

Now they were entering a region of space filled with ships; hundreds of drive sparks flitted over the patient ocean of Jupiter. The ships were too distant to afford any detail, but Poole knew that there must be Navy ships from the inhabited Jovian moons, science craft from the inner Solar System, and God-damned tourists and rubbernecks from just about everywhere. A subdued chatter in the background of the lifedome told him that signals were starting to come in from that motley armada - since the receipt of Berg’s message a year earlier, Poole knew, Jovian space had been the centre of attention for most of the human race, and his own arrival here had been

the most eagerly anticipated event since the emergence of the future ship itself.

He ignored the messages, letting Virtual copies of himself handle them; if there was anything devastating they'd let him know.

Peering into the crowded space ahead, and after his decades of isolation in the bleak outer lands of the Solar System, Poole felt a pang of absurd claustrophobia. He was driven on by curiosity as well as by a residual concern for Miriam Berg and her crew; but now that his year-long journey in from the Oort Cloud was complete he found he really, really didn't want to be here, back among the fetid worlds of humankind.

Harry was studying him, his youthful brow creased. 'Relax, son,' he said. 'It was never going to be easy.'

'Oh, for Christ's sake, shut up,' Poole snapped. Even as he spoke he was aware of an odd feeling of relief at having someone, or something, reasonably tangible outside his own head to react to. 'I should put you in an electronic bottle labelled "Dad", and take you out when I feel the need of another patronizing fatherly homily.'

Harry Poole grinned, unmoved. 'Just doing my job,' he murmured.

Now the *Crab*, drive still blazing ahead of her, was approaching the most dense knot of ships in the sky. The cloud of vessels, as if sensing the approach of the *Crab*, began to part.

Inside that firefly mist Michael could make out the lines of something huge, a splash of green against the murky pink of Jupiter.

'That's it,' Poole said, finding his voice hoarse. 'The ship from the future. Time to go to work ...' He snapped a command into the air.

The crowded universe outside the lifedome was clouded by a sudden hail of pixels which danced like dust motes around the *Crab*, slowly congealing into planes, orbs and strands around the lifedome. Harry squirmed in his seat, mouth open, as he watched the huge Virtual take shape around the ship. At last they were looking out through eyes which were each at least a hundred yards wide, with eyelids which swept like rainstorms over the glistening lenses. A nose like a vast engineering project, with nostrils like rocket nozzles, obscured the *Crab*'s GUTdrive module; and huge sculpted ears sailed alongside the lifedome.

A mouth, whale-sized, opened moistly.

‘My God,’ Harry breathed. ‘It’s you, isn’t it? We’re looking out through your face.’

‘I couldn’t think of any other way to be sure we were identified properly. Don’t worry: the Virtual is all show; it’s not even as sentient as you are. It repeats a five-second phrase of greeting, over and over again.’

‘So how will they hear what it has to say?’

‘Harry, the Virtual is two miles high,’ Poole said, irritated. ‘Let them lip-read!’

Harry swivelled his head, surveying the nostrils, the cable-like hairs above the cabin, skin pores the size of small asteroids. ‘What a disgusting experience,’ he said at last.

‘Shut up and watch the show.’

Now there were ships all around the camouflaged *Crab*. Poole recognized Navy ships which bristled with weapon ports, science platforms open and vulnerable, even one or two inter-moon skitters which should surely never have been allowed so close. Many of the larger craft followed the same basic design as the *Crab*, with drive unit and living quarters separated by a stem; from this distance the ships looked like lighted matchsticks, scattered through space.

‘How do you think the men from the future will react to us?’ Harry asked with sudden nervousness.

Poole, glancing across, saw Harry chewing a nail, a habit he remembered from a distant childhood. ‘Maybe they’ll shoot us out of the sky,’ he said maliciously. ‘What do you care? You’re tucked up in bed on Earth, well away from any danger.’

Harry looked at him reproachfully. ‘Michael, let’s not go over that again. I’m a Virtual, but I have my identity, my sense of being.’

‘You think you do.’

‘Isn’t that the same thing?’

‘Anyway, I doubt if we’re in any danger,’ Poole said. ‘The future people haven’t made any attempt to use weapons so far; why should they now?’

Harry nodded grudgingly. ‘True.’ After the future ship had settled into its orbit around Jupiter there had been several attempts by Navy ships to approach the craft. The future humans hadn’t responded, or fired on the Navy ships; they’d simply run away, faster than they could be tracked.

‘Maybe they haven’t any weapons,’ Harry said.

Poole pursed his lips. ‘That’s possible, I guess. They do have their super-drive, though.’

‘I know there’s speculation that could be some kind of hyperspace drive,’ Harry said.

‘Maybe. But if that’s true we’ve no idea how it works. It’s not possible to extrapolate from existing technologies, the way I speculated about singularity technologies.’

‘Maybe it’s not a human invention. Maybe it’s alien.’

‘Anyway, I don’t think we’re in any danger of being fired on; and if they want us to come in they’ll not run away.’

‘How reassuring,’ the Virtual murmured.

Now the last few layers of craft peeled away before them, the GUTdrive fire-sparks scrabbling aside like scared insects.

The future craft was revealed, like a fragment of landscape emerging through a layer of cloud. The *Crab*’s drive died at last, and Poole’s Virtual, mouthing its idiot words of greeting, loomed over a disc of green Earth a quarter-mile wide. Poole could clearly make out the ring of ancient stones at its centre, like grey-brown scars against the greenery. A belt of anonymous-looking dwellings encircled the stones, and beyond the belt grass grew as in some surrealist’s vision, all the way to the edge of the world; the green of it clashed in his eyes with the purple-pink of Jupiter, so that it was as if the craft were encircled by a scar of indeterminate colour.

Close to the rim Poole made out a splash of metal, a scarred crater in the grass. Could that be a boat from the *Cauchy*?

Sparks of light, like entrapped stars, were sprinkled over this floating fragment of Earth. And here and there Poole could see tiny, insect-like forms crawling across the landscape. People? He imagined faces upturned in wonder to his own vast, smiling mouth.

He scanned the lifedome’s instrument displays briskly, watching data chatter in on the lifeboat’s mass - about that of an asteroid - and its gravitational configuration and radiation characteristics.

‘I’ve seen pictures and I’ve read about it,’ Harry said, ‘but I don’t think I really believed it until now.’

‘It looks more fragile than I expected,’ Poole murmured.

‘Fragile?’

‘Look at it. Why build a timeship under a clod of earth like that, with so little protection? ... Unless, perhaps, you wanted to hide what you were doing.’

‘They can run, but they can’t fight,’ Harry said.

‘Yeah. Maybe these aren’t the heroic, superpowered gods from the future we anticipated after all. Maybe these people are refugees.’

Harry seemed to shiver. ‘Refugees from what?’

‘Well, at least they haven’t fled from us yet. Come on; let’s get to the boat and see if they will let us land.’

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7

Michael Poole brought the *Crab*'s boat down near the grassy lip of the craft from the future, close to the wreckage of a lifeboat.

Followed by the Virtual of his father, he walked out onto a green plain. For a moment he felt disoriented. Beneath his feet there was grass, the blades coarse enough for him to feel them through the soft soles of his boots; globes the size of his fist hovered eight feet above him, giving off a Sol-like yellow warmth, and towards the centre of the disc-craft a concentration of the globes produced a cosy, Earthlike island of light. There was even a hint of blueness about the layer of atmosphere over the disc of land.

But above him - like some immense roof over creation - hung the banded clouds of Jupiter. It took a conscious effort not to cringe from that lowering sky.

'You know,' he said to Harry, 'I found it quite hard to step out of the boat. I feel naked, standing here.'

'I know what you mean.' Harry took a deep, theatrical sniff. 'But the air smells as good as the tests showed it to be. Why, you can even smell the grass growing.' He bounced on his toes. 'And near Earth-normal gravity, as we estimated from orbit.'

'Quit showing off,' Poole grumbled. 'It's hard to understand how anyone could have the guts to ride through time clinging to this damn thing.' He thought of Berg huddled against this ground as the broken exotic-matter walls of the wormhole hurtled past her, and he felt an unfamiliar stab of protectiveness. Damn it, Berg could look after herself as well as anyone he'd known - certainly a lot better than he could himself - but nobody deserved to be put through such an experience.

His protectiveness began to fade to an uncertain guilt, as he wondered if he ought to hold himself responsible, if indirectly, for the chain of events which had resulted in this.

He watched Harry walk out of sight around the *Crab*'s boat; the craft, a cylindrical lump of metal still frosted from the chill of space, sat on this plain of grass as incongruous as a bullet on an altar-cloth.

'My God,' Harry called.

Poole followed his father. Harry stood, hands on hips, surveying the wrecked lifeboat they'd seen from the *Crab*.

The boat had been sliced open like a ripe melon. The laser-strokes through the hull were razor-sharp - almost pleasing in their clarity and neatness. Poole could see how the interior of the craft had been scorched and melted, and how partitions had softened and flowed towards the soil.

'Well, it's no ordinary wreck,' Harry said. 'And look.' He pointed to an intact hull panel. 'See the registration?'

'It's from the *Cauchy*. Harry, this is Miriam's boat, it has to be.' A kind of helpless panic surged through him. 'What the hell's been done to her?'

'Nothing, Michael. I'm all right. See?'

Poole whirled at the sound of the deep, slightly hoarse, and desperately familiar voice. He saw all of her as if in a blur - the tough, lively face, the thatch of cropped hair, eyes that looked soft with tears. Without willing it he found himself in her arms. Miriam was a few inches taller than Michael, and her slim body, encased in a coarse, pink jumpsuit, was tense for a moment, though her arms encirded his back; and then she relaxed, and the length of her body pressed against his. He buried his face in the soft warmth of her neck.

When he was able he released her, grasped her shoulders and peered into her face. 'My God, Miriam, I thought you were dead. When I saw the lifeboat—'

She smiled, her lips thin. 'Not very friendly of them, was it? But they haven't done me any harm, Mike; they just' - now the stiffness returned - 'they just stop me from doing things. Maybe I'm getting used to it. I've had a year of it now ...'

'And the journey through time? How was that?'

Her face seemed to crumple, before she regained control. 'I survived it,' she said.

Poole stepped away from her with a sense of embarrassment. He was aware of Harry standing close beside him, but kept his eyes averted from Harry's face; he was two centuries old, and he was damned if he was going to put up with any more fatherly affection. Not right now.

There was a woman with Miriam, he saw now: as tall as Miriam, slightly scrawny, her thin, bony face young-looking and pretty - except for a dome of a shaven head, which Poole found it hard to keep his eyes away

from. The woman regarded him steadily. Her pale-eyed gaze was somehow disturbing: Poole saw in it the naivety of youth overlaid with a kind of blank impassivity.

Harry stepped forward to the girl and held out his arms. ‘Well, Michael got his welcome; how about me?’

Michael groaned inwardly. ‘Harry—’

The girl swivelled her head to Harry and took a neat step back. ‘That would be pleasant if it were possible, sir,’ she said, her face solemn.

Harry grinned and shrugged theatrically. ‘Are my pixels showing again? Damn it, Michael, why didn’t you tell me?’

Berg leaned close to Poole. ‘Who’s the asshole?’

‘Would you believe, my father?’

Berg screwed up her face. ‘What an embarrassment. Why don’t you pull the plug? He’s only a Virtual.’

‘Not according to him.’

‘Michael Poole.’ Now the girl, having extricated herself from Harry’s attention, was facing Poole; her complexion was quite poor, the skin around her eyes bruised-looking and tired. Poole felt himself drawn to the weakness of this girl from the future - such a contrast to the high-technology superbeings he’d imagined in his wilder moments. Even the single-piece coverall she wore was, like Miriam’s, of some coarse, cheap-looking artificial fabric.

‘I’m Poole,’ he said. ‘You’ve already met my father.’

‘My name is Shira. I’m honoured to meet you.’ Her accent was modern-sounding but neutral. ‘Your achievements are still famous, in my day,’ the girl said. ‘Of course we would not be here to meet you without your Interface project—’

Berg cut in sharply, ‘Is that why you let them land, instead of blowing them out of the sky?’

‘We would not have done that, Miriam Berg,’ Shira said. She sounded vaguely hurt.

‘Okay, but you could have cut and run with your hyperdrive, like you did from the other ships—’

The word hit Poole like a slap to the face. ‘They *do* have a hyperdrive?’

Berg said sourly, ‘Sure. Now ask if she’ll let you inspect it.’

Harry pressed forward and pushed his young face close to the girl's. 'Why have you come here, to our time? Why has there been only one message from this craft to the rest of the Solar System?'

'You have many questions,' Shira said, holding her hands up before her as if to ward Harry off. 'There will be time to answer you at leisure. But, please, you are our guests here; you must allow us to receive you into our hospitality.'

Harry pointed at the sliced-open wreckage of the *Cauchy* lifeboat. 'Some hospitality you've shown so far.'

'Don't be crass, Harry,' Poole said, irritated. 'Let's hear what they have to say.' He turned to the girl and tried to sound gracious. 'Thank you, Shira.'

'I'll take you to my home,' Shira said. 'Please follow me.' And she turned and led the way towards the centre of the earth-craft.

Poole, Harry and Berg trailed a few paces behind Shira. Harry's Virtual eyes flicked everywhere as they entered the loose maze of single-storey, grey-walled buildings which covered the central section of the craft.

Poole tried to keep from touching Berg, from grabbing her again as if he were a boy.

As they walked, Poole had the odd sensation that he was stepping into, and then climbing out of, shallow dimples in the grass-coated earth; but the area looked level, as far as he could see. The dimples seemed to be about a yard in width. He watched Shira covertly as she led them through the little village; she was walking gracefully, but he noticed how she, too, rocked backwards and forwards from the vertical by a few degrees, as if negotiating invisible potholes.

Harry, of course, sailed a fraction of an inch over the grassy surface.

Harry leaned close to Berg and whispered, 'She looks about twenty-five. How old is she really?'

'About twenty-five.'

'Don't kid me.'

'I'm serious.' Berg ran a hand through her wire-stiff crop of hair. 'They've lost AS technology ... or, rather, had it taken away from them. By the Qax.'

Harry looked as if he couldn't believe it. 'What? How can that have happened? I imagined these people would be far in advance of us ... That

was part of the thrill of Michael's time-interface experiment in the first place.'

'Yes,' Poole said grimly, 'but it looks as if history isn't a monotonic process. Anyway, who are the Qax?'

'She'll tell you,' Berg said grimly. 'She won't tell you much else, but she'll tell you about the Qax. These people call themselves the Friends of Wigner.'

'Wigner?' Poole asked. 'Eugene Wigner, the quantum physicist?'

'As far as I know.'

'Why?'

Berg shrugged sadly, her bony shoulders scratching against the rough material of her jumpsuit. 'I think if I knew the answer to that, I'd know most of it.'

Poole whispered, 'Miriam, what have you found out about the gravity generator?'

Berg looked at him. 'Do you want the detail, or just a précis?'

'A précis will do—'

'Diddley squat. They won't tell me anything. I don't think they want to tell *anybody* anything. Frankly, I think they'd prefer I wasn't here. And they certainly weren't enamoured of me when I smuggled out my signal to you.'

'Why me?' Poole asked.

'Partly because I thought that if anyone could figure out what's going on here it would be you. And partly because I thought that you had a better chance than anyone else of being allowed to land here; yours is about the only name from our era these people know. And partly—'

'Yes?'

Berg shrugged, on the edge of embarrassment. 'Because I needed a friend.'

Walking beside her, Poole touched her arm.

He turned to the Virtual. 'Harry, these invisible dips in the landscape—'

Harry, surprised, said, 'What dips?'

'They're about a yard apart,' Poole said. 'I think they're caused by an unevenness of a few per cent in whatever's generating the gravity in this place.'

Berg nodded. 'I figured out that much. We must be climbing in and out of little gravity wells, right?'

‘Harry, tell me if the dips are consistent with a distribution of point masses, somewhere under the surface in the body of the craft.’

Harry nodded and looked unusually thoughtful.

‘What does he know?’ Berg asked.

‘I’m not asking him,’ Poole said patiently. ‘I’m really asking the boat. Miriam, Harry’s like a camouflaged terminal to the boat’s central processor; one of the main reasons - no, *the* main reason - for bringing him along is that the future folk might find him easier to accept than a packful of lab equipment.’

Harry looked pained, but he kept ‘thinking’.

They reached what was evidently Shira’s ‘home’, a conical ten-feet-tall tepee. There was an open triangular entrance. Smiling, Shira beckoned them in. Poole ran a fingertip over the edge of the doorway; the dove-grey material of the tepee was rigid, vaguely warm to the touch - so not metallic - and felt more than sharp enough to cut flesh.

Two of the fist-sized light-globes hovered near the roof of the tepee, casting softened double shadows; they bobbed like paper lanterns in response to random currents in the air. The inner walls were blank of decoration - they bore the same dull dove-grey sheen as the exterior - and the floor area, fifteen feet across near the base, contained a single piece of furniture, a low, hard-looking bed, and what looked like thick rugs, or perhaps scatter-cushions.

They stood around awkwardly. Interestingly, now they were inside the tepee Harry seemed to be having trouble with his resolution; his face and limbs crumbled into sugar-cube-sized pixels, and then reassembled.

Shira bade them sit, and left them.

Stiffly, Berg and Poole pulled a couple of the cushions to the centre of the floor and sat, a few inches apart; Harry made a show of sitting on the bed, but the resolution was so poor that from time to time he broke up into such a cloud of disparate pixels that Poole could see right through him, to the grey wall. Poole laughed. ‘You look terrible,’ he said.

‘Thanks,’ Harry said, his voice indistinct. ‘It’s the material of the walls; it’s blocking the signal from the boat. What you’re getting is scattered through the doorway.’

‘What about the gravity wells?’

Harry nodded, his face furred with pixels. ‘You were right. The dips are consistent with point masses, ten million tons each, set out in a hexagonal array a yard under the surface we stand on ... Here comes Shira.’

Shira floated through the doorway, smiling, bearing three plates on a tray. ‘From our kitchens. I’m sorry there’s nothing for you,’ she said to Harry. The Virtual’s reply was lost in a defocused blur - mercifully, thought Poole.

The light-globes, clearly semi-sentient, dipped closer to their heads, casting an incongruously cozy light over the meal. The globes didn’t seem to be aware of Harry, though, and drifted through his head and upper chest; Harry, stoical, ignored them. Poole wasn’t hungry but he used the plain metal cutlery Shira handed him to cut into his meal curiously. The food was hot. There was something which had the fibre of a white meat, and a thick green vegetable like cabbage, soft as if overboiled. Shira poured a clear, sparkling drink from a bottle into small blue beakers; sipping it, Poole found it had a sweet, mildly alcoholic tang, like a poor wine.

‘It’s good,’ he said, evoking a polite smile from Shira. ‘What is it?’

‘Sea food,’ said Berg around a mouthful. ‘The meat stuff is based on an edible fungus. And the green sludge is processed seaweed.’

Shira nodded slightly, in assent.

‘Sounds efficient,’ Poole said.

‘It is,’ said Berg sourly. ‘Although that’s all it is. Mike, they’ve shown me some pictures of their Earth. Cities flattened. The continents bordered by thick, chlorophyll green: offshore farms. The produce from what’s left of the planet’s arable dry land is exported off-planet. The complex molecules are highly prized, apparently, and raise a good price. For the Qax. Michael, they’ve turned the planet into a damn factory.’

Dark speculations filled Poole’s head. Shira’s poor physical state, the confiscation of AS technology, the occupation of Earth by an alien power ... When he’d envisaged the future to which he had built a bridge he’d foreseen strangeness, yes, but *progress* . . . dignity.

Instead, here was this shabby girl with her flavourless food ...

He asked Berg, ‘Who do the Qax get a good price from?’

She turned to him with a thin, strained smile. ‘You’ve a lot to catch up on, Michael. It’s a big galaxy out there. A jungle. Dozens, hundreds of races competing for resources.’

Poole put his plate down beside him on the rug, and faced Shira calmly. ‘I’m full of questions,’ he said. ‘And the fragments Miriam has learned have only added to them. I know you’re reluctant to share what you know, but—’

‘I won’t deny that,’ Shira said, graciously enough. Her eyes were warm. ‘But you are a scientist, Michael Poole; and the skill of a scientist is in asking the right question.’ She gestured, indicating the tepee, her fragment of world. ‘From all you have seen today, what is the right question, do you think? Ask it and I shall try to answer you.’

Harry, a blur of pixels, murmured: ‘The right question? But how—’

Poole shut out Harry’s voice and tried to focus, to find the key to all this teeming strangeness, a way into the girl’s bizarre world. ‘All right,’ he said. ‘Shira - what are the walls of the tepee made of?’

Shira nodded, a faint smile on her thin lips. ‘Xeelee construction material,’ she said.

‘And who,’ asked Poole carefully, ‘are the Xeelee?’

Shira sipped her wine and, thoughtfully, answered him.

The Xeelee owned the universe.

When humans emerged from the Solar System, limping along in the first sublight GUTdrive ships, they entered a complex universe peopled by many intelligent races. Each race followed its own imperatives, its own goals.

When humans dealt with humans, in the days before interstellar flight, there had always been a residual bond: they all belonged to the same species, after all. There had always been a prospect of one day communicating, sharing, settling down to a mutually acceptable system of government.

Among the races men encountered, as they peered in awe about their suburb of the Galaxy, there was no bond; there was no law, save the savage laws of economics.

Not two centuries after Poole’s time, Earth had been captured and put to work by the group-mind aquatic creatures called the Squeem.

Harry whistled. ‘It’s a tough place out there.’

‘Yes,’ Shira said seriously. ‘But we must regard junior races like the Squeem - even the Qax - as our peers. The key advantage held over us by the Squeem, in those first years, was hyperdrive technology.’ But the

hyperdrive, like many other of the key technological components of the local multispecial civilization - if it could be called that - was essentially Xeelee in origin.

Wherever men, or any of the races men dealt with, had looked, the Xeelee were there, Shira said. Like gods, aloof from the rest: all-powerful, uncaring, intent on their own vast works, their own mysterious projects.

'What are those projects?' Poole asked.

Nobody knew, Shira said. It was hard to be sure, but it seemed that the other junior races were just as ignorant.

Berg leaned forward. 'Are we sure the Xeelee exist, then?'

'Oh, yes,' said Shira with certainty.

The Xeelee were aloof ... but a little careless. They left fragments of their technology around for the junior races to pick up.

'We think this stuff is trivial for the Xeelee,' said Shira. 'But a single artifact can be enough to galvanize the economy of a race - perhaps give it a significant advantage over its neighbours.' Her face, in the uneven light of the hovering globes, looked still more drawn and tired. 'Michael, we humans are new to this; and the other species are hardly open to questioning. But we believe that wars have been fought - genocides committed - over artifacts the Xeelee must regard as little more than trinkets.'

Shira gave him some examples:

Hyperdrive. Poole's mouth watered.

The construction material: monomolecular sheets, virtually indestructible, which, in the presence of radiant energy, would grow spontaneously from the fist-sized objects known as 'Xeelee flowers'.

Instantaneous communication, based on quantum inseparability—

'No,' Poole protested. 'That's not possible; you can't send information down quantum-inseparability channels.'

Shira smiled. 'Tell the Xeelee.'

Innovation among the junior races was nearly dead, Poole learned. It was a waste of effort, it was universally felt, trying to reinvent something the Xeelee had probably developed a billion years ago. And besides, while you devoted your resources to researching something, your neighbour would probably spend his on a pirated Xeelee version of the same thing and come blazing into your home system ...

Shira sketched more of the story of mankind.

The light, inefficient yoke of the Squeem was thrown off with (in retrospect) ease, and humans moved out into the Galaxy again, in new ships based on the Xeelee hyperdrive ... stolen, at second hand, from the Squeem.

Then humans encountered the Qax. And people were made to grow old again.

'And are you here to escape the Qax?'

Shira's mouth closed, softly. Obviously, Poole thought, he was reaching the boundaries of what Shira was prepared to tell him.

'Well, then,' he said, 'your intention must be to find a way to overthrow them.'

Shira smiled. 'You're an intelligent man, Michael Poole. It must be obvious that I don't wish to answer such questions. I hope you won't force me to be rude—'

Berg snorted and folded her arms. 'Damn it, here's the brick wall I've come up against since this clod of earth came flying up in the path of the *Cauchy*. Shira, what's obvious to me is that you're out to get rid of the Qax. But why the hell won't you let us help you? We might seem primitive to you, but, lady, we can pack a punch.'

'We've discussed this before,' Shira said patiently.

'But she has a point,' Poole said. 'If nothing else, we can offer you AS technology. *You don't have to grow old*, Shira; think about that.'

Shira's expression remained unclouded. 'I doubt if you'll believe me, but that really doesn't matter.'

Harry seemed to shiver. 'This girl gives me the creeps,' he said, blurred.

'I believe you,' Poole said patiently to Shira. 'I understand there are more important things than life itself ... But still: Miriam has a point. What have you to gain by turning aside the resources of a Solar System?'

'Maybe they just don't trust us to help,' Harry mused. 'Maybe we'd be like chimpanzees working alongside nuclear physicists ... or, perhaps she's scared of a time paradox.'

Berg shook her head, her sour expression fixed on the girl. 'Maybe. But I've another theory.'

'Which is?' Poole asked.

'That if they let us know what they're really up to, *we'd stop them*.'

Shira's laugh was unconvincingly light. 'This is a pleasant game.'

Poole frowned. ‘Well, at least I’ve learned enough to understand now some of the things that have been puzzling me,’ he said.

Shira looked nonplussed.

‘Your ship was constructed under the nose of an occupying force,’ he said. ‘So you were forced to build it in camouflage.’

‘Yes.’ Shira smiled. ‘We are proud of our deception. Until the moment of its launch, when we activated a hyperdrive shell, the earth-craft was indistinguishable from any other patch of Earth, save for the ancient stones which served further to misdirect the Qax.’

‘Hence no hull,’ Poole said. ‘But still, the craft was more than detectable. After all, it has the mass of a small asteroid; there must have been gravitational anomalies, detectable by the Qax from orbit, before its launch.’

Shira shrugged, looking irritatingly amused. ‘I cannot speak for the Qax. Perhaps they have grown complacent.’

Poole, sitting cross-legged on the thin cushion, settled back on his haunches. He peered into the girl’s calm face. There was something about Shira that troubled him. It was hard to remember that, in the absence of AS treatment, her chronological age was the same as her biological age; and youth, Poole realized with a twinge of sadness, had become a novelty in his world. But for a girl of twenty-five she had an inner deadness that was almost frightening. She had described the bloody history of mankind, the depressing vista of endless, undignified war between the stars, even the Qax Occupation - of which her knowledge was first hand - with flat disinterest.

It was as if, Poole realized uneasily, life held no meaning for this girl.

He leaned forward. ‘All right, Shira, let’s not play games. I know what you’re doing here; what I don’t yet know is *why* you’re here.’

Shira dropped her eyes to the empty tray, the cooling food. She asked quietly, ‘And what is it, in your judgement, that we are intending to do?’

Poole thumped his fist against the Xeelee-material floor. ‘Your earth-craft is a honeycomb of singularities. And that, apart from the hyperdrive, is all you seem to have brought back through time. And you’ve stayed in Jovian orbit. You could have used your hyperdrive to go anywhere in the System, or beyond ...

‘I think you’re planning to implode Jupiter; to use your singularities to turn it into a black hole.’

He heard Harry gasp. Berg touched his shoulder. ‘My God, Michael; now you know why I wanted you here. Do you think they can do it?’

‘I’m sure they can.’ Poole kept his eyes locked on Shira’s downturned face. ‘And it’s obvious that the project is something to do with the overthrow, or the removal, of the Qax from their future occupation. But I don’t yet know how it will work. Nor have I decided if we should let them do it.’

Shira lifted her head to him now, her weak blue eyes lit by a sudden anger. ‘How dare you oppose us? You’ve no idea what we intend; how can you have the audacity—’

‘How can you have the audacity to change history?’ Poole asked quietly.

Shira closed her eyes and sat in a lotus-like position for a few seconds, her thin chest swelling with deep, trembling breaths. When she opened her eyes again she seemed calmer. ‘Michael Poole, I would prefer you as an ally than as an enemy.’

He smiled at her. ‘And I you.’

She stood, her limbs unwinding gracefully. ‘I must consult.’ And, without saying any more, she nodded and left.

Poole and Berg picked at the now cold food; Harry watched them through a haze of static.

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8

Parz, alone, curled up tightly, floated in Spline entoptic fluid. ‘Jasoft Parz. Jasoft. You should wake now.’

Parz uncurled abruptly, the dense liquid and his skintight environment suit making the movements of his limbs heavy. He blinked to clear sleep from his eyes. A single light-globe floated with him in the three-yard-wide chamber which contained him; the heavy fluid, disturbed by his movements, cast graceful, waved shadows on the blood-red walls.

For a second he was disoriented, unable to remember where he was, why he was here; he thrashed, helpless as a hooked fish, clumsily swimming towards the nearest wall. Tubes trailed after him like transparent umbilical cords, linking him to a heavy metal box fixed to one wall.

‘Parz. Are you awake? It is time.’

The voice of the Qax - of the new Governor of Earth, the bleak, murderous Qax from the future - sounded again, but it had an oddly calming effect on Parz as he clung to thick folds in the fleshy wall of the chamber; his fragmented attention focused on the words, and something of his composure returned.

He whispered, finding his throat closed and dry. ‘Yes, I’m awake.’

‘I will open the eyelid.’

‘No, please.’ Jasoft, with a bizarre sense of modesty, felt reluctant to have the curtains of this makeshift sleeping chamber drawn aside before he was fully ready. He pushed away from the wall and operated controls embedded in the right wrist of his suit. ‘Give me a minute.’

The Qax did not reply; Parz envisaged its impatience.

Parz’s skinsuit, a transparent overlay over thin cotton garments, had been designed for long-duration wear. Now Parz felt the material whisper over his skin; his pores were cleansed, his beard, toe- and fingernails trimmed. A nipple popped out of the inside of his faceplate, which he pressed to his lips, and an ice-cool liquid flavoured like fresh apple juice coursed into his mouth. When he was done he opened his mouth and let ultrasonics work on his teeth.

He emptied his bladder and watched the waste filter back along the pipes to the wall unit for recycling.

His breakfast and toilet over, Parz spent a few minutes bending and stretching, trying to work all of his major muscle groups. He worked particularly hard on his back and shoulders; after eight hours in a foetal position his upper spine - still heavy with age, despite the AS treatments - creaked with a papery stiffness.

When he was done his breathing was a little deeper and he felt the tingle of fresh blood reaching the surface of his flesh. Ruefully, he realized that this was as good as he was going to feel all day. These suits were good at what they did, but living in one was no substitute for a decent cabin: for waking up to a shower with fresh water, and a breakfast of something you could actually bite into, damn it.

Well, that hadn't been an option. Nor had his attendance on this whole damn mission of the Qax's, of course.

'Parz,' the Qax rasped. 'You've had five minutes.'

Parz nodded. 'I'm sorry,' he said. 'I needed time to wake up properly.'

The Qax seemed to think that over. 'Parz, the next few subjective hours could be the most significant in the history of both our species. You are privileged to be the only human of your era to witness these events. And you took time to cleanse yourself after your sleep?'

'I'm human,' Parz snapped. 'Even when the world is coming to an end I have to put my trousers on one leg at a time.'

The Qax considered that. 'And your metaphorical trousers are now on?'

'Open the damn eyelid.'

The walls of the Spline's huge eyeball trembled, sending small shock waves through the heavy entoptic fluid to brush against Jasoft's skin. Muscles hauled at sheets of heavy flesh, and the eyelid lifted like a curtain. Through the rubbery greyness of the Spline's cornea, salmon-pink light swept into the eyeball, dwarfing the yellow glow of Jasoft's light-globe, and causing his slender, suspended form to cast a blurred shadow on the purple-veined retina behind him. Jasoft swam easily to the inside face of the pupil; feeling oddly tender about the Spline's sensations, he laid his suited hands carefully on the warm, pliant substance of the lens.

Outside, the universe was a blurred confusion of pink, gunmetal grey and baby blue; Jasoft kept his eyes steady, giving their image-enhancing software time to work. After a few seconds deconvolution routines cut in

with an almost audible click, transforming the blurred patches to objects of clarity, and therefore menace.

There was Jupiter, of course: huge cyclones tracked across its bruised, purple-pink countenance. Another ship glided past - a second Spline, its pores bristling with sensors and weaponry. The eyeball Parz inhabited rotated to follow the second ship, and swirls in the entoptic fluid buffeted Parz, causing him to bounce gently against the lens.

Now Parz's Spline turned, driven by some interior flywheel of flesh, blood and bone; the eye swept away from Jupiter and fixed on the baby-blue patch he'd seen earlier, now resolved into a tetrahedron of exotic matter. Sheets of elusive silver-gold stretched across the triangular faces of the Interface portal, sometimes reflecting fragmented images of Jupiter, and sometimes permitting elusive glimpses of other times, other starfields.

The portal came steadily into Parz's view. The Spline must already be inside the squeezed-vacuum exoticity zone which surrounded the mouth of the wormhole itself, and soon the portal was so close that Jasoft had to press his faceplate against the warm Spline lens to make out its vertices.

'It's almost time,' he whispered.

'Yes, Ambassador,' the Qax growled. 'Almost time.'

The words which sounded in his headpiece were - as ever - bland, synthesized, the product of a translator box somewhere in the Spline. 'Qax, I wish I knew what you were feeling.'

The Qax paused for some seconds. Then, 'Anticipation. Anticipation of satisfaction. My goal is close. Why do you ask this?'

Jasoft shrugged. 'Why not? I'm interested in your reactions. Just as you must be interested in mine. Otherwise, why would you have brought me here?'

'I've explained that. I need a way into human perceptions.'

'Rubbish,' Parz said without anger. 'Why do you bother to justify yourself in that way? Qax, you're travelling back in time to destroy humanity - to eradicate forever the unlimited potential of a species. What do you care about human perception?'

'Jasoft Parz,' the Qax said, its voice almost silky now, the relish audible, 'you are the only human to return through time with this Qax expedition. Fifteen centuries ago humans were still largely confined to the dull star system of their birth. When we have destroyed the home planet - and

scoured the neighbouring worlds and spaces - you will be the only human left alive. And, with the termination of your species' line, you will also be the last human. How will that feel?'

Parz felt his lifetime of compromise - of *diplomacy* - weigh down on him, a cargo still heavy despite his AS rejuvenation. He tried, as he'd tried before, to comprehend the significance of the Qax's monstrous act. Surely it was his duty, as the last human, to *feel* the pain of this crime, to suffer on behalf of his race.

But he couldn't. It was beyond him. And, he thought, he had moved beyond hope.

He wondered how he'd feel, though, if he had children of his own.

He nodded, infinitely tired. 'So. You've brought me here so you can watch me, as I watch my race die. I did not understand before; I guess I was hoping for - what? nobility? - from the murderer of my species. But it really is as petty as that. My reaction, the grief of one man, will amplify for you the emotional significance of the event. It will heighten your pleasure. Won't it?'

'Pleasure? I am not psychopathic, Jasoft Parz,' the Qax said. 'But the sweetness of my revenge will be great.'

'Revenge for what?'

'For the destruction of my own world, of the home of the Qax, by the actions of a single human.'

Parz had been told something of the story.

A few centuries after Parz's era, there would be a human: Jim Bolder, an unremarkable man. The Qax would try to employ Bolder, to exploit him for gain. But Bolder would deceive them - somehow trick them into turning starbreakers on their own sun.

The new Governor came from a future in which the comparatively lenient Occupation of Earth had led, inexorably, to the destruction of the Qax home world, to a diaspora in which dozens of the fragile Qax had perished. In this timeline the Qax were marginalized; humans, freed of the Occupation, grew far stronger.

The Qax wanted to change all that.

Ironically, Parz had come to understand, the rebellion of the Friends of Wigner had nothing to do with the ultimate collapse of the Occupation, in this timeline. Whatever the rebels' scheme was it was seen as irrelevant by

the Qax - in fact, the sequence of time bridges initiated by the rebellion was actually an *opportunity* for the Qax to move back into time, far beyond Bolder, and to rectify their earlier leniency.

Parz, baffled and disturbed by the philosophy of it all, wondered if a multiplicity of variant worlds would be initiated by this series of trips into the past, of closed timelike curves. In the original variant, the prime timeline, saw no impact on events from either the rebels' activities or the Qax's actions; the timeline would unfold with relentless logic to the Qax dispersal. The Qax, now, hoped to return through time to crush humanity before such events had a chance to occur; this second variant would see the emergence of the Qax as the dominant species in the absence of mankind. The rebels presumably, with their unknown project, hoped to initiate a third variant in which the Occupation would be crushed before the time of Jim Bolder - of whom, of course, the rebels could have no knowledge; to them the Occupation must have looked immense and eternal.

But even that wasn't the end of it, Parz realized; for presumably the actions of the various groups of time travellers would interact to set off a fourth, fifth or sixth variant ... But most human philosophers seemed to agree, now, that only one of these variants could be considered 'real'; only one could be collapsed into actuality by the observation of conscious minds.

Parz pressed his face against the warm lens material; it yielded like thin rubber. The electric-blue struts of the Interface portal had almost embraced the Spline now; the nearest face, which already blocked out the stars, the moons of Jupiter, was dark and empty, its blackness relieved only by a hint of autumn gold. Parz twisted his head about. He caught a glimpse of the second Spline he'd seen earlier; it hovered above and behind the Qax's ship, following it towards the portal. 'Some armada,' he said. 'Two ships?'

'Two are all that is required. The humans of fifteen centuries ago will have no means of defence against the weaponry of the Spline craft. The second craft will destroy the vessel of these rebels from your present - these Friends of Wigner - while my ship will besiege Earth.'

Parz felt his throat tighten. 'How?'

'Starbreaker beams.'

Parz closed his eyes.

'Maybe your revenge won't be so sweet,' he said, seeking advantage randomly. 'What about causality? Maybe I'll pop out of existence as soon

as my ancestors are destroyed. Maybe you will, too. Have you thought about that? And then the destruction of your world by this human hero will never have happened ... and you'll have no reason, or means, to travel through time to assault the Earth.' But then, he thought further, if the Qax did not travel back through time, surely humanity would survive to destroy the Qax world after all ... 'We'll be caught in a causality loop, won't we?'

'Jasoft Parz, causality does not operate in such a simplistic fashion. In such a circumstance the different outcomes may all exist simultaneously, like the probabilities expressed by a quantum function. But only one of those possibilities will be collapsed into actuality—'

'Are you sure?' Parz said grimly. 'You're talking about destroying a race ... about altering history on a cosmic scale, Qax.'

'Yes, we are sure. My intention is to close off all probabilities, all variants of reality in which humanity can survive. After the destruction of your System, you will be the only human left alive.'

'And you and I will disappear into nonexistence,' Parz said grimly.

'No,' the Qax said. 'But the timeline from which we emerged will no longer exist, as a potentiality. We will be stranded, out of time. But my job will be done.'

Yes, Parz thought, what it's saying is possible. It was more than genocide. The Qax was plotting not just the destruction of humankind but the destruction of all variant realities in which humanity might have survived.

The Qax's calculation somehow penetrated Parz's numbed heart more deeply than anything else. How could a sentient being discuss such gruesome events - the destruction of species, of worlds, of *timelines* - in the language of cold logic, of science?

Damn it, Parz protested silently; we're talking about the snuffing out of species - of the potential of countless billions of souls as yet unborn ...

But, as always, he realized dully, the Qax were doing nothing which humans had not tried to perpetrate on members of their own species in the past.

'Parz, shortly we will be entering the throat of the wormhole. You must be prepared for causality stress.'

'Causality stress?' Parz stared into the blank, gaping mouth of the wormhole portal; the hints of silver-gold were gone now, leaving only a

darkness which grew over the stars. ‘You know, Qax, you intend to destroy my home world. And yet all I feel now is a personal dread of entering that damn wormhole.’

‘You are a limited species, Jasoft Parz.’

‘Perhaps we are. Perhaps we’re better off that way.’

The Spline trembled; to Jasoft, cushioned as he was by the entoptic matter, the mile-wide animal’s shudder was like a mild earth tremor.

‘I’m frightened, Qax.’

‘Imagine my concern.’

The Spline’s shuddering became continuous; Parz felt it as a high-frequency vibration of the entoptic fluid - small waves beating against his flesh like insect wings - and an underlying bass rumble which resounded from the immense skeleton of the Spline itself. The ship was suffering.

‘Qax. Talk to me.’

‘What about?’

‘Anything,’ Parz muttered. ‘I don’t care. Anything to take my mind off this. Tell me the story of how a human destroyed your planet ... Tell me about Jim Bolder.’

‘Will destroy it. Would have destroyed it.’

‘Whatever.’

The Qax seemed to consider. ‘Perhaps. But, what an odd question for you to ask, Jasoft Parz. I must consider what you have to gain by acquiring such information. Perhaps you have some vain scheme to use the data to rehabilitate yourself in the eyes of your people ... from the race’s greatest traitor, to an unsung hero—’

Parz, surprised, frightened, looked inwards. Traitor? A month ago he would have denied the charge.

But now the Qax had changed the rules. Suddenly Parz had found himself transformed from a morally dubious collaborating diplomat into a witness to the destruction of his race ...

The Spline shuddered again, more violently, and through the entoptic medium he seemed to hear a low groan, of pain, or terror.

Could the Qax be right? Was some element of his subconscious still scheming, looking for advantage, even now? Did he, he asked himself with wonder, still entertain hope?

The Qax was silent.

Now the Spline shuddered so hard that Parz was thrown into a soft collision with the wall of the huge eyeball. It felt as if the Spline had jerked through a few hundred yards, as if hauling itself away from some source of pain.

Jasoft closed his eyes and, with a subvocalized command, ordered the software in his eyes to call up an external image of the Spline, transmitted from the companion ship.

His craft was entering the portal face, inching forward as delicately as in any docking, the curves of its flanks almost brushing the powder-blue edges of the tetrahedral framework.

Parz was a hundred hours away from the past.

The Qax spoke abruptly, its decision evidently made. ‘The human was - will be - called Jim Bolder. A man of the Occupation era - from not far into your own future, Parz.

‘Bolder was one of the last human pilots. Eventually the Qax interdiction on human operation of spacecraft will become complete, Jasoft Parz. Ships will be impounded on landing. The off-Earth human colonies will become self-sufficient. Or they will be closed, their inhabitants returned to Earth. Or they will die.

‘Men such as Bolder will lose their vocation, Parz. Their reason to be. This made - will make - it possible to recruit Bolder for a special assignment.’

The clean geometries of the Interface framework looked stark against the flesh of the Spline. At one point the Spline came within a few dozen yards of brushing the frame itself. Flesh toughened against the rigours of hyperspatial travel was *boiling*. As Parz watched, blisters the size of city blocks erupted on that pocked, metal-grey surface; the blisters burst like small volcanoes, emitting sprays of human-looking blood which froze instantly into showers of red ice crystals, sparkling in the blue glow of the framework. Acres of the Spline convulsed, trying to pull the damaged area away from the exotic matter.

‘What was Bolder’s assignment?’ Parz asked.

‘Parz, what do you know of galactic drift?’

Galaxies - and clusters and superclusters of galaxies, across half a billion light-years - were moving in great, coherent streams through space. It was as if the galaxies were moths, drawn towards some unseen light ...

Human astronomers had described such drift for centuries, but had never been able satisfactorily to explain it.

‘What does this have to do with Bolder?’

‘We suspected the drift had some connection with the Xeelee,’ the Qax said.

Parz snorted. ‘Come on. The Xeelee are powerful, but they’re not gods.’

‘We sent Bolder to find out,’ the Qax said mildly.

Parz frowned. ‘How? That’s impossible. Even in the fastest of our hyperdrive craft it would take centuries of subjective time—’

‘We had access to a Xeelee ship.’

Parz felt his jaw working. ‘But that’s impossible, too.’

‘Such details are unimportant. It is sufficient to know that Bolder survived his journey to the centre of the streaming.’

‘To the place where all the galaxies go.’

‘Yes,’ said the Qax. Although, close enough to the centre, Bolder had found that the structure of all but the most compact ellipticals was shattered; galaxy fragments, stars and worlds tumbled into the immense gravity well at the centre of it all, their blue-shifted light tumbling ahead of them.

‘And at the bottom of the well?’

The Qax paused.

To Parz, still studying the Spline from without, it was as if the portal framework were scorching the flesh of the hapless Spline. But it wasn’t heat, he knew, but high-frequency radiation and gravity tides raised by the superdense exotic matter which were damaging the Spline so. Parz shuddered in sympathy with the suffering Spline.

The image winked out. Parz, reduced to sudden artificial blindness, realized with a shock that his ship must now be totally inside the wormhole. With a feeling of claustrophobia and panic he snapped out subvocal commands.

His vision cleared.

The eye chamber had been reduced to the darkness within which he had first awoken; his faithful globe light still floated beside him.

So the Spline had shut its eyes. Well, he couldn’t entirely blame it.

The ship shuddered, buffeted; entoptic fluid sloshed around the spherical chamber. Parz half-swam to the nearest wall and clung to a ropy nerve channel.

‘Gravitational stress,’ the Qax murmured in his ear. ‘This wormhole is a throat in space and time, Parz: a region of stress, immensely high curvature. The throat is lined with exotic matter throughout; we are traversing a vacuum which runs along the axis, away from the exotic matter. The minimum width of the throat is about a mile. Our velocity is three miles per second.’

‘Not fast enough,’ Parz gasped.

Vibration travelled through Parz’s grasping fingers, up through his arms and to his very core; it felt as if the Spline were being beaten by some immense fist. ‘Can the ship endure this?’

‘So the simulations tell us,’ the Qax said complacently. ‘But the creature is scarcely comfortable.’

‘Right.’ Parz clung to his nerve rope, imagining centuries unravelling around the hurtling Spline. ‘Tell me what Bolder found,’ he said through chattering teeth. ‘At the bottom of the gravity well.’

A Ring, the Qax said. A torus. Composed of some unknown, crystalline substance. A thousand light-years across. Rotating at a respectable fraction of the speed of light.

It was massive. It had caused a well in spacetime so deep that it was drawing in galaxies, including Earth’s Milky Way, from across hundreds of millions of light-years.

‘I don’t believe it,’ Parz said, still shaking in sympathy with the Spline.

‘It is an artifact,’ the Qax said. ‘A Xeelee construct. Bolder watched the Xeelee build it.’

Xeelee craft - cup-shaped freighters the size of moons, and fighters with nightdark wings hundreds of miles wide - patrolled the huge construction site. With cherry-red starbreaker beams they smashed the infalling, blue-shifted galactic fragments and plated layers over the growing Ring.

‘We believe the Xeelee have already invested billions of years in this project,’ the Qax said. ‘But its growth is exponential. The more massive it becomes, the deeper the gravity well grows, and the faster matter falls towards the site, feeding the construction crews further.’

‘But why? What’s the point of it?’

‘We speculate that the Xeelee are trying to construct a Kerr-metric region,’ the Qax said.

‘A what?’

The Kerr metric was a human description of a special solution of Einstein's equations of general relativity. When spacetime was distorted by a sufficiently massive, rotating toroid, it could - open.

'Like a wormhole?' Parz asked.

'Yes. But the Kerr-metric interface would not connect two points in the same spacetime, Parz. It is a throat between spacetimes.'

Parz struggled to understand that. 'You're saying that this - "Kerr-metric region" - is a doorway - a way out of our universe?'

'Crudely, yes. The Xeelee are trying to build an exit from this cosmos.'

'And to do it they're prepared to wreck a region of space hundreds of billions of light-years wide . .

Suddenly Parz was blind again. Hurriedly, panicking, he issued commands; but this time his vision would not clear. The darkness in which he was immersed was deeper than that of closed eyes ... it was, he realized with a terrifying clarity, the darkness of nothingness, of emptiness. 'Qax.' His own voice was muffled; it was as if all his senses were failing together. 'What's happening to me?'

The Qax's voice came to him, distant but clear. 'This is causality stress, Parz. The severance of the causal lines, of the quantum wave functions in which you are embedded. Causality stress is causing sensory dysfunction ...'

Jasoft felt his body senses softening, drifting away from him; he felt as if he were becoming disembodied, a mote of consciousness without anchor in the external universe.

The Qax continued to speak. Its voice called to Parz like a distant trumpet. 'Jasoft Parz. This is as difficult for me, for any sentient being, as it is for you ... even for the Spline. But *it will pass*. Do not let it undermine your sanity. Concentrate on what I am saying to you.

'Jim Bolder, in his stolen craft, evaded the Xeelee engineers. He returned to the Qax home system, where his journey had begun. Jasoft, the Qax are a trading nation. Bolder had returned with a treasure valuable beyond price: data on the greatest Xeelee artifact. It will not surprise you that the Qax decided to, ah, retain the data.

'But Bolder tricked us.'

There was a glimmering around Parz now, a ghostly shimmer, a reflection of ripples, like moonlight on a sea.

‘The details have never become clear. Bolder should have emerged from hyperspace into a region surrounded by Spline warships, all bearing gravity-wave starbreaker technology ... He failed to do so. Bolder survived, escaped.

‘Starbreakers were used. In the confusion and panic, they brushed the Qax sun. It was enough to cause the sun to become unstable - ultimately, to nova.

‘The Qax were forced to flee. Dozens of individuals died in the exodus. Our power was lost, and the Occupation of Earth crumbled ...’

Jasoft Parz, bewildered and disoriented as he was, could not help but exult at this.

A grey light, without form and structure, spread around him ... No, not around him, he realized; he was part of this light: it was as if this were the grey light which shone beneath reality, the light against which all phenomena are shadows. His panic subsided, to be replaced by a sense of calm power; he felt as if he were light-years wide and yet no wider than an atom, a million years old and yet fresher than a child’s first breath. ‘Qax. What the hell is happening?’

‘Causality stress, Parz. Perceptual dysfunction. Causality is not a simple phenomenon. When objects are joined once, they become part of a single quantum system ... and they must remain joined forever, via superlight quantum effects. You should imagine you are walking across a beach, calling into existence a trail of footsteps as you go. The footsteps may fade with time as you pass on, but each of them remains bound to you by the threads of quantum functions.’

‘And when I pass out of my own region of spacetime?’

‘The threads are cut. Causal bonds are broken and must be reformed ...’

‘Dear God, Qax. Is this pain worth it, just to travel through time?’

‘To achieve one’s goals: yes,’ the Qax said quietly.

‘Finish the story,’ Jasoft Parz said.

‘Finish it?’

‘Why are the Xeelee building a way out of the universe? What are they seeking?’

‘I suspect if we knew the answer to that,’ the Qax said, ‘we would know much of the secret truth of our universe. But we do not. The story must remain unfinished, Jasoft Parz.

‘But consider this. What if the Xeelee are not seeking something *beyond* their Ring - but are fleeing something in *this* universe?

‘What do the Xeelee fear, do you suppose?’

Parz, buffeted, disoriented, could find no reply.

The Spline warship surged through time.

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9

The Friend of Wigner, Jaar, was waiting for Michael Poole at the entrance to the *Crab*'s grounded boat.

Poole stood on the boat's exit ramp, bathed in eerie Jovian light. He looked out at the waiting young man, the scatter of Xeelee construction-material buildings in the distance, the glimpse of ancient stones - and over it all the looming, perfect curve of Jupiter.

He felt too old for this.

He'd got through the events of the previous day - the landing, the encounter with Miriam, the bombardment with the unfamiliar - on a kind of psychic momentum. But the momentum had gone now; he'd emerged only reluctantly from a troubled sleep to face the dangers, the pressures of the day, the need to find a way to deal with Miriam's presence here.

Miriam had spent the sleeping period in the boat. Harry had had the decency to abandon his rights-for-AIs rhetoric for a few hours and had gone into stasis to leave them alone. But Miriam and Michael hadn't slept together. What were they, kids? They had talked, and held each other's hands, and had finally stumbled to separate bunks. Somehow, acquiescing to lust didn't seem the right reaction to a century of separation, or the renewal of an antique, and combative, relationship.

He wished he hadn't let Harry talk him into this jaunt. He would have exchanged all he had seen and learned to return to the sanctuary of his station in the Oort Cloud, his slow tinkering at the fringes of exotic-matter physics.

Of course if he got his head cleaned out, as Harry had done, he'd be able to face all this with a fresh eye. Well, the hell with that.

Poole walked down the ramp and on to the tough English grass. The Friends of Wigner smiled at him; Poole saw a young man, tall and whiplash thin, dressed in the standard-issue pink coverall. Bony wrists and ankles protruded from the coarse material. Under a high, clean-shaven dome of a scalp he shared the pallid, hothouse complexion of Shira, and his eyes were watery-brown. Jaar's stance was a little awkward. Poole guessed that even fifteen centuries hence someone of this height and build would spend his life ducking to avoid looking clumsy, but there was something beyond that, something about the way the Friend's legs looked bowed ...

Rickets. Was it possible that such a curse had been allowed to return to the Earth? Poole's heart leapt.

'You are Michael Poole. I am honoured to meet you.'

'And you're Jaar - the guide Shira promised?'

'I am a physical sciences specialist. I trust you slept peacefully.'

'Not very.' Poole grinned. 'I have too many questions.'

Jaar nodded with the solemnity of the young. 'You have a fine mind, Mr Poole; it is natural for you to question—'

'And,' Poole went on sharply, 'Shira said she'd send someone who could provide answers.'

Jaar smiled obscurely, and in that expression Poole recognized something of the abstractedness of Shira. Jaar seemed disengaged, uninterested in this little duel, or indeed in any form of interpersonal contact. It was as if he had much more important things on his mind.

'Shira did say that there was little purpose trying to hide from you anything whose existence you had already deduced.'

'So you've been sent along to humour an old man?'

'No one *sent* me, Mr Poole,' Jaar said. 'I volunteered for the honour.'

'It's me who's honoured, Jaar.'

With a little bow Jaar invited Poole to walk with him. Side by side, they strolled across the pink-stained grass towards the heart of the earth-craft.

Poole said, 'You're only the second Friend I've met ... and yet you seem very similar, in disposition, to Shira. Forgive my rudeness, Jaar, but are all you Friends so alike?'

'I don't think so, Mr Poole.'

'Call me Michael. But you have an inner calm, a strange certainty - even after running the gauntlet of the Qax navy; even after falling willy-nilly through a hole in spacetime ...'

'I am sure that what we have come here to do is right.'

Poole nodded. 'Your Project. But you're not allowed to tell me what that is.'

'Like you, I was born with the curse of an inquiring mind. It must be infuriating to have an area of knowledge blocked from you like this ... I apologize. ' Jaar's smile was smooth, bland, unyielding; his bald head seemed oddly egglike to Poole, seamless and devoid of detail. 'But you must not think we are all alike, Michael. The Friends are from very different

backgrounds. Granted we were selected for this mission on the grounds of youth and physical fitness, so we share those characteristics; but perhaps we seem similar to you simply because we are from such a removed frame of reference. Perhaps the differences between us are diminished by our distance from you.'

'Perhaps,' Poole said, and he laughed. 'But I'm not naïve, lad.'

'I'm sure that's so,' Jaar said smoothly. 'And yet, lacking AS technology, none of us shares your two hundred years, Mr ... Michael.' For a precious second he sounded almost mischievous. 'Perhaps you simply aren't used to the company of young people.'

Poole opened his mouth ... then closed it again, feeling vaguely embarrassed. 'Maybe you're right,' he said.

They walked silently for a while.

An inner calm, a strange certainty . . . Poole wondered if the mysterious purpose of this mission could have some mystical, or religious, content; perhaps it wasn't the scientific or engineering project he had first assumed. He had a sudden, bizarre image of the battered stones of the henge being aligned with a sunrise over the cloudy limb of Jupiter ...

There were certainly elements of a religious devotion among these strange young people. Their blank demeanour, their lack of *hope for themselves*, he thought. Yes, that was the key to it. Somehow they had no dreams of personal gain, or happiness, in all this. Perhaps the mission plan called for them to sacrifice their lives, Poole wondered; and now he imagined the fragile earth-craft, its mission over, plunging into the forbidding depths of the Jovian atmosphere, ancient menhirs tumbling away like stone chips.

But what religious sect would style itself the Friends of Wigner?

They reached the 'village' which surrounded the ancient henge at the heart of the earth-craft. Jaar led Poole past cones, cylinders and cubes, all a few feet above head-height and composed of the dove-grey Xeelee substance, and scattered over the grass. Save for the signs of habitation it was, thought Poole, like wandering through the play-pen of some child. Knots of young people moved about their tasks calmly and unhurriedly; some of them bore the flat, compact computing devices Berg had called 'slates'.

They reached a hemispherical hut, anonymous among the rest. ‘What’s this?’ Poole asked. ‘Home, sweet home? No offence, but I ate enough seaweed with Shira yesterday—’

Jaar laughed, not unpleasantly. ‘No, Michael; though I would be honoured if you would be my guest in my quarters later. This building is for access.’

‘Access?’

‘To the interior of the earth-craft. To the plane of singularities.’ Jaar studied him, seeming puzzled ‘That’s what you wanted to see, wasn’t it?’

Poole smiled. ‘What are we waiting for?’

They stepped into the dome, Jaar ducking his head under the razor-sharp lintel. Poole felt light on his feet here, almost buoyant; the surface gravity must be a little less than that outside. Inside the dome a slim cylinder rose from a floor of Xeelee material. A doorway was cut into its wall.

Jaar climbed in, hunching his thin shoulders; Poole followed. Silently the door shut, sealing them in. The chamber was cramped, seamless, filled with a diffuse, pearly light, of which Poole could find no source; it was a little like being inside a neon tube, he thought.

Poole was aware of Jaar studying him with a kind of amused patience. Now Jaar smiled. ‘This is an elevator. The terminology hasn’t changed since your day. It will take us into the interior.’

Poole nodded, feeling oddly nervous; he wasn’t exactly used to exposing himself to the possibility of physical danger. ‘Right. So we’re in an elevator shaft, cut through the plane of singularities. Hence the reduced gravity.’

Jaar seemed to respond to his nervousness. ‘If you’re not ready—’

‘You don’t have to coddle me along, Jaar.’

‘All right.’ Jaar touched a section of blank wall. He did not try to hide what he was doing from Poole, even though he must have been aware that Poole would memorize every moment of this trip.

There was no noise. But the floor seemed to fall away. Poole’s stomach lurched and, without intending to, he reached behind himself for the stability of the wall.

Jaar murmured, ‘It will pass.’

Now, as Poole floated, a band of pressure passed up the length of his body; but it was an inverse, negative pressure, like the pressures of exotic

matter, which pulled his stomach and chest outwards rather than compressed them.

Jaar still watched him steadily with his blank brown eyes. Poole kept his face carefully neutral. Damn it, he should have been prepared for this; as Jaar had said he'd deduced the structure of the interior of the craft already. 'The plane of singularities,' he said, his voice reasonably steady. 'We're passing through it. Right?'

Jaar nodded approvingly. 'And the pressure you feel about your chest is the gravitational attraction of the singularities. When you stand on the surface of the earth-craft the plane is below you and draws you down, so simulating the gravitational field of the Earth; but here in the interior of the craft the plane is all around us.'

The gravitational plane had reached Poole's neck now; absurdly he found himself raising his head, as if trying to keep it above water.

Jaar said, 'Now, Michael - be ready. You may want to anchor yourself to the walls, as before.'

'This time I've worked it out. We're going to tip over. Right?'

'Be ready.'

Now the plane passed over Poole's head and away from him. For a few seconds there was a disconcerting feeling of sweeping upwards which rapidly changed, as Poole's sensorium went through a hundred-and-eighty degree swivel, to a sense of plummeting head-first downwards. Then came rotation, the sharp pull of Coriolis forces at his belly. The elevator cage was turning about an axis somewhere near his waist. Oddly enough Poole did not feel threatened now; it was like being a small child again, like swinging through the air in the strong, safe arms of Harry. The real Harry.

The turn was completed. The sideways Coriolis died away; with a sigh of relief Poole felt himself settle to a normal-feeling floor. Not quite normal; he felt his ears pop. Jaar smiled kindly at him. 'Don't worry,' he said. 'It took me a while to get used to it.'

Poole frowned, feeling an absurd need to demonstrate his manhood to this young man. 'I've told you you don't need to coddle me. We've passed through the plane; now we've turned upside down, so the holes are beneath our feet again, and everything feels normal. Right?'

Jaar nodded, in unmoved assent. He placed his palm against another section of the wall and the elevator door slid aside.

Jaar stepped out onto a clear, glassy surface. Poole followed, almost stumbling; in the gentle gravity the clear surface was as slippery as hell. When he was steady on his feet, Poole raised his head.

The earth-craft was hollow.

Poole was at the centre of an artificial cave that looked as if it made up most of the craft's bulk. Above his head there was a dome of Xeelee dove-grey, about twenty yards tall at its highest point, and below him a sheet of glass which met the dome at a seamless horizon. Beneath the glass was a hexagonal array of blue and pink bars, each cell in the array about a yard wide.

Tubes of glass - hollow shafts, each a yard wide - rained from holes in the roof, terminating six feet above the floor. It made the dome look like some huge, absurd chandelier, Poole thought. A blocky control console was fixed to the floor beneath each tube. Through the holes in the roof Poole could see patches of Jovian cloud-pink. The shafts looked like fairyland cannon, pointing at Jupiter.

People - young men and women in pink jumpsuits, Wigner's Friends - moved about the clear surface, talking and carrying the ubiquitous slates, the huge, sparkling pillars dangling unnoticed above their heads. The Friends moved with the mercury-slow grace Poole associated with inhabitants of low-gravity worlds like Luna. Their voices, low and serious, carried clearly to Poole.

The diffuse light seemed to come from the domed ceiling itself, with a little blue-pink toning from the array beneath the floor. It was like being in the imaginary caverns inside the Earth conjured up by one of Poole's favourite authors, the ancient Verne.

Jaar smiled and bowed slightly. 'So,' he said, 'the guided tour. Over your head we have a dome of Xeelee construction material. In fact the construction material passes under the floor we stand on and under the singularity plane, forming a shell within the craft broken only by the access shafts.'

'Why?'

Jaar shrugged. 'The construction material is impervious to all known radiation. '

'So it protects the passengers from riding too close to the black holes.'

‘And it prevented the Qax from detecting our activity and becoming overly suspicious. Yes. In addition, our hyperdrive engine has been incorporated into the fabric of the construction-material shell.’

Poole pointed to the floor. ‘And under here, the plane of singularities.’

Jaar dropped to one knee; Poole joined him, and they peered through the floor at the enigmatic spokes of blue and pink-violet. Jaar said, ‘This surface is not a simple transparent sheet; it is semi-sentient. What you see here is largely a false-colour rendering.

‘You have deduced, from your observations of the dimpled gravity field on the surface, that our craft is held together by mini-black hole singularities.’ He pointed to a node in the hexagonal array. ‘There is one of them. We manufactured and brought about a thousand of the holes with us through time, Michael.’

The holes, the Friend explained, were charged, and were held in place by an electromagnetic lattice. The false colours showed plasma flux lines in the lattice, and high-frequency radiation from infalling matter crushed by the singularities.

Hawking evaporation caused each singularity to glow at a temperature measured in teradegrees. The megawatts generated by the captive, evaporating holes provided the earth-craft’s power - power for the hyperdrive, for example.

The evaporation was whittling away at the mass-energy of each hole, inexorably. But it would take a billion years for the holes to evaporate completely.

Poole peered at the gaudy display sombrely; it was difficult to believe that only a few feet beneath him was an object smaller than an electron but with the mass of a city block, a pinpoint flaw in the structure of spacetime itself. And below *that* was a plane of grass from which clung, like flies to a ceiling, the *Crab*’s boat, Berg, Shira and the rest, the toylike buildings of the Friends of Wigner; and - oddest of all - the ancient stones of the henge, dangling there in Jupiter’s light like rotting teeth in the upper jaw of an incomplete, furred-over skull.

There must be a layer of air all the way around this craft, he thought. Of course the air must get pretty thin away from the high-gravity regions, close to the centre of the plane of singularities.

Stiffly, he climbed to his feet. ‘I’m grateful for what you’ve shown me,’ he said.

Jaar studied him, tall, very bald, disturbingly pale. ‘And what do you feel you have learned?’

Poole shrugged, deliberately casual. With a wave of his hand he indicated the cavern. ‘Nothing new. All this is impressive, but it’s just detail. The singularity array. There is the meat of the mission; that’s what you’ve gone to all this trouble to bring back through time.’ He pointed to the shafts which led to the rents in the construction-material dome. ‘Those things look like cannon barrels, pointing at Jupiter. I think they *are* cannon - singularity cannons. I think that one by one you’re going to release these singularities from their electromagnetic nets and propel them out of those tubes and towards Jupiter.’

Jaar nodded slowly. ‘And then what will we do?’

Poole spread his hands. ‘Simply wait ...’

He pictured a singularity - a tiny, all but invisible, fierce little knot of gamma-radiation - swooping in great, slow ellipses around Jupiter, on each orbit blasting a narrow channel through the thin gases at the roof of the atmosphere. There would be a great deal of drag; plasma bow waves would haul at the singularity as it plunged through the air. Eventually, like grasping hands, the atmosphere would claim the singularity.

Rapidly spiralling inwards, the hole would scythe through Jupiter’s layers of methane and hydrogen, at last plunging into the core of metallic hydrogen. It would come to rest, somewhere close to Jupiter’s gravitational centre. And it would start to grow.

‘You’ll send in more and more,’ Poole said. ‘Soon there will be a swarm of singularities, orbiting each other like insects inside the solid heart of the planet. And all growing inexorably, absorbing more and more of Jupiter’s substance. Eventually some of the holes will collide and merge, I guess, sending out gravitational waves that will disrupt the outer layers of the planet even more.’ Maybe, Poole speculated, the Friends could even control the merging of the holes - direct the pulsed gravity waves to sculpt the collapse of the planet.

Until, like a cancer, the holes would have destroyed Jupiter.

As the core was consumed the structure would implode, like a failing balloon; Poole guessed the planet would heat up and there would be pockets

of disruption and instability - explosions which would blast away much of the substance of the atmosphere. Tidal effects would scatter the moons, or send them into elliptical orbits; obviously the human inhabitants of the region would have to evacuate. Maybe some of the moons would even be destroyed by tidal stresses and gravitational waves.

'At last,' Poole said, 'there will be a single, massive singularity. There will be a wide accretion disc composed of what's left of the Jovian atmosphere and bits of smashed satellites; and the rest of the moons will loop around the debris like lost birds.'

Jaar's silence was as bland as Xeelee construction material.

Poole frowned. 'Of course, a single singularity would be enough to collapse Jupiter, if that's all you want to do. So why have you brought this great flock of the things?'

'No doubt you've figured that out too,' Jaar said dryly.

'Indeed. I think you're trying to control the size of the final singularity,' Poole said. 'Aren't you? The multiple "seed" singularities will cause a fraction of the mass of the planet to be blown away, detached before the final collapse. I think you've *designed* this implosion to result in a final hole of a certain size and mass.'

'Why should we do that?'

'I'm still working on that,' Poole said grimly. 'But the timescales ... This could take centuries. I understand a great deal, Jaar, but I don't understand how you can think in those terms, without AS.'

'A man may plan for events beyond his own lifetime,' Jaar said, young and certain.

'Maybe. But what happens when you've shot off the last of your singularities? The earth-craft is going to break up. Even if the inner shell of construction material keeps its integrity, the exterior - the soil, the grass, the very air - is going to drift away, as the source of your gravity field is shot into space.'

He imagined the menhirs like the limbs of giants lifting from the grass, sailing off into Jovian space; it would be a strange end for the ancient henge, far stranger than could have been imagined by those who had carved the stones.

'And what will become of you? You seem determined to refuse any help from us. You must die ... perhaps within a few months from now. And

certainly long before you see your Project come to fruition, with the collapse of Jupiter.'

Jaar's face was calm, smooth, expressionless. 'We will not be the first to sacrifice our lives for a greater good.'

'And the repulse of the Qax is a greater good? Perhaps it is. But—' Poole stared into the Friend's wide brown eyes. 'But I don't think a noble self-sacrifice is all that's happening here. Is it, Jaar? You show no interest in our offers of AS technology. And you could be evacuated before the end. There isn't really any need for your sacrifice, is there? But you don't fear death at all. Death is simply ... irrelevant.'

Jaar did not reply.

Poole took a step back. 'You people frighten me,' he said frankly. 'And you anger me. You rip Stonehenge out of the ground. Stonehenge, for Christ's sake! Then you have the audacity to come back in time and start the destruction of a planet ... the gravitational collapse of most of the System's usable mass. Jaar, I'm not afraid to face the consequences of my own actions. After all I was the man who built the time machine that brought you here. But I don't understand how you have the audacity to do this, Jaar - to use up, destroy, so much of humanity's common heritage.'

'Michael, you must not grow agitated over this. I'm sure Shira told you the same thing. In the end, none of this' - he indicated the cavern -'none of us - will matter. *Everything will be made good*. You know we're not prepared to tell you any more than you've figured out already. But you must not be concerned, Michael. What we are doing is for the benefit of all mankind - to come, and in the past ...'

Poole thrust his face into the young man's. 'How dare you make such claims, lay such plans?' he hissed. 'Damn it, man, you can't be more than twenty-five years old. The Qax are a terrible burden for mankind. I've seen and heard enough to be convinced of that. But I suspect your Project is more, is bigger, is vaster than any threat posed by a simple oppressor like the Qax. Jaar, I think you are trying to change history. But you are no god! I think you may be more dangerous than the Qax.'

Jaar flinched briefly from Poole's anger, but soon the bland assurance returned.

Poole kept the boy in the cavern for some time, arguing, demanding, threatening. But he learned nothing new.

At last he allowed Jaar to return him to the outer surface. On the way up Poole tried to work the elevator controls, as he'd watched the Friend do earlier. Jaar didn't stop him. Of course, the controls did not respond.

When they returned to the grassy plain Poole stalked away to his ship, full of anger and fear.

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‘**M**ichael.’ Harry Poole’s voice was soft but insistent. ‘Michael, wake up. It’s started.’

Michael Poole emerged from sleep reluctantly. He pushed back his thin blanket, rolled onto his back and rubbed his eyes. Beside him, he saw, Berg was already awake and sitting up. Poole lifted himself onto his elbows, wincing at a stab in his lower spine: Shira’s little hut was quiet enough, and the air of the earth-craft was still and comfortably warm; but - despite Miriam’s assurances that the hard surfaces were doing him the world of good - he doubted if he would ever get used to sleeping on nothing more than an inch of coarsely stuffed pallet over a floor of Xeelee construction sheeting.

Miriam Berg was already pulling on her one-piece Friends’ jumpsuit. ‘What’s started, Harry?’

The Virtual construct of his father, coarsened by diffraction, hovered over Poole. ‘The high-energy particle flux from the Interface portal has increased. Something’s coming, Michael. An invasion from the future - we’ve got to get out of here.’

Poole, still struggling into jumpsuit and shoes, stumbled to the tepee’s open doorway. He squinted in the Jovian light and turned his face to the sky. The Interface portal hung there, delicate and beautiful, apparently innocent of menace.

‘Spline,’ Berg breathed. ‘They’ll send Spline through. The living ships the Friends described, the warships of the Qax, of the Occupation, come to destroy the earth-craft. Just as we’ve expected.’

There was an edge in Berg’s voice Poole had never heard before, a fragility that induced in him an atavistic urge to take her in his arms, shield her from the sky.

Berg said, ‘Michael, those things will defeat the best humanity can throw at them - *fifteen centuries from now*. What can *we* do? We haven’t got a hope of even scratching their ugly hides.’

‘Well, we can have a damn good try,’ Poole murmured. ‘Come on, Berg. I need you to be strong. Harry, what’s happening in the rest of the System?’

The Virtual, sharp and clear here outside the tepee, shrugged nervously. ‘I can’t send a message out, Michael. The Friends are still blocking me. But

the ships in the area have detected the high-energy particle flux.' He met Michael's eyes, mournfully. 'Nobody knows what the hell's going on, Michael. They're still keeping a respectful distance, waiting for us to report back. They don't see any threat - after all, the earth-craft has simply sat here in Jovian orbit for a year, enigmatic but harmless. What can happen now?' He looked vaguely into the sky. 'People are - curious, Michael. Looking forward to this. There are huge public Virtuals, images of the portal and the earth-craft hovering over every city on Earth ... It's like a carnival.'

'But once the Qax begin their assault—'

'It will be too late.' Berg took Michael's arm; her face was still a mask of fear, he saw, but some of her determination, her cunning, seemed restored. 'Listen to me. The best chance of hitting them is going to be now ... in the first few minutes after the Spline emerge from the portal.'

Poole nodded. 'Right. Causality stress.'

'The Spline are living creatures,' Berg said. 'Maybe that's a weakness we can play on; the Qax, and their ships, are surely going to take a while to ramp up to full effectiveness. If we can hit them fast maybe there's a chance.'

Berg was right, of course. There was a kind of inevitability to all of this, Poole thought. *It's going to be up to us*. He closed his eyes, longing for the silence - the lack of decisions - in the Oort Cloud.

Harry laughed, his voice brittle and too bright. 'Hit them fast? Sure. With what, exactly?'

Poole whispered, 'With the singularity cannon.'

Berg looked at Michael sharply, possibilities lancing through her mind. 'But - even if we get the Friends to agree - the cannon wasn't designed as a weapon.'

Michael sighed, looking tired. 'So we adapt.'

Harry said, 'As long as the damn things can be pointed and fired. Tell me how they're supposed to work. You fire black holes into Jupiter ...'

'Yes,' Michael said. 'A pair of singularities is launched in each cannon shot. Essentially the device is a true cannon; once the singularities are launched, their paths are ballistic. Orbiting each other, a few yards apart, the singularities enter Jupiter's gravity well. The trajectories are designed to merge at a specified point in the body of the planet.'

Berg frowned. 'Ultimately the hole, or holes, will consume Jupiter ...'

‘Yes. The Project’s design is to render Jupiter into a single, large black hole of a specified mass—’

‘But that could take centuries. I know the holes’ growth would be exponential, but still you’re starting from a minuscule base; the holes can only grow as fast as their area allows them.’

‘That’s true.’ He smiled, almost wistfully. ‘But the timescale of the Project was longer than centuries; far longer.’

Berg tried to drag thoughts, ideas from her mind, ignoring the lowering sky above her.

How could they use this planetbuster cannon to disable a Spline? If they simply shot off black holes, the tiny singularities would pass through the flesh of the warship. No doubt tidal and other effects would hurt the Spline as the holes passed through, and maybe they’d strike it lucky and disable some key component ... but probably not; the Spline was a mile wide and the wounds inflicted by the traversing holes would surely be not much worse than laser shots.

A multiple strike, a barrage?

‘What if we launched two singularities to come to rest at the centre of mass of the Spline? Could we do that?’

‘Of course.’ Michael frowned; Berg could almost see trajectory curves rolling through his head. ‘We’d simply need to launch the singularities with a low velocity - below the earth-craft’s escape velocity, essentially.’

‘Yes.’ Berg pictured it. Like stones hurled into the air, the singularities would come to rest, hover in the body of the Spline itself ... But only for a moment, before falling back. What good would that do? It would take days for the holes to consume the Spline’s mass - hours, probably, to absorb enough material to inflict any significant damage - not the few seconds they would be present in the volume of the Spline.

Anyway, they wouldn’t have hours to spare.

Then what?

‘Why would they send the singularities into Jupiter on such complex trajectories? ’ Harry asked. ‘Why have them merge *before* they reach the centre?’

Michael shook his head. ‘You haven’t grasped the subtleties of the design,’ he said seriously.

‘Evidently not,’ Harry said dryly.

‘Do you understand what happens when two singularities converge, combine? ’ He mimed, with his two fists, the singularities approaching each other, whirling around each other, finally merging. ‘The event horizons merge into a single horizon of greater net area ... Entropy, proportional to the area, increases. The singularities themselves, the flaws in space at the heart of the holes, fall in on each other; blueshifted radiation increases the effective mass until the final merger occurs on Planck timescales - the immense gravitational fields generated effectively deflate time. And the joint event horizon quivers like a soap bubble, generating radiation through quadrupolar effects.’

Berg nodded slowly. ‘And what form does this - radiation - take?’

He looked surprised by the question. ‘Gravitational, of course. Gravity waves.’

She took a deep breath, felt her blood surge through her veins a little fast. *Gravity waves.*

Michael explained further.

These weren’t the dinky little ripples in spacetime, propagating at lightspeed, which had been studied by human astronomers for centuries ... When two massive singularities merged, the gravity waves were monstrous. Nonlinear distortions of spacetime itself.

‘And the radiation is directed,’ Michael said. ‘It pulses along the axis of the hole pair. By choosing precisely the placement and orientation of the holes at merger inside the carcass of the planet, you can direct gravity-wave pulses as you choose. You can sculpt the implosion of Jupiter by working its substance on a massive scale; it was the Friends’ intention, I believe, even to remove some of the mass of the planet before the final collapse. The precise size, angular momentum and charge of the final black hole are evidently important parameters for the success of—’

But Berg was no longer listening. Then the earth-ship wasn’t just - *just* - a singularity-cannon platform. It was a gravity-wave gun.

A human-built starbreaker.

They could fight back.

Michael looked up and gasped. The colour of the sky had changed, and cast grey shadows across his face.

Berg looked up. A vast moon of flesh slid complacently towards the zenith, its gunmetal-grey surface pocked with eye sockets and weapon

emplacements. Bloody scars a hundred yards wide disfigured the skin-hull. Berg searched for the Interface portal and made out another of the great elephant-ships emerging from the future. One of its limbs brushed the sky-blue wire framework of the portal, and a layer of flesh boiled away as the immense mass of the exotic matter raised *tides* in living tissue.

Spline ...

It had begun.

Jasoft Parz, suspended in entoptic fluid, clung to the rubbery material of the Spline's cornea and peered out at the past.

Parz's ship was climbing out of Jupiter's gravity well now, on its way to its hyperspace jumpoff point to the inner planets. The wormhole Interface portal was receding; the portal looked like a bluish scar against the swollen cheek of Jupiter. Parz could see that a second Spline ship, the companion of his own, already loomed over the scrap of Earth-green that was the rebels' craft.

Parz sighed. 'The rebel ship is elegant.'

The Qax said, 'It is a scrap of mud hurled into space by hyperactive apes.'

'No. Look at it again, Qax. A camouflaging layer of earth built over a shell of Xeelee construction material ... They must have stolen a Xeelee flower, constructed this thing in some deep, hollowed-out cavern.' He laughed. 'And all under your watchful gaze.'

'Under my predecessor's gaze,' the Qax said slowly. 'According to the ship's sensors the thing is constructed around a layer of singularities. A thousand of them, the total amounting to an asteroid-scale mass ...'

Parz whistled. 'That doesn't sound possible. How—'

'Obviously such masses could not be transported from space,' the Qax said. 'The rebels must have evolved some technique of assembling such materials from the substance of the planet.'

Once humans had been able to engineer artifacts of exotic matter. Evidently not all of that technology had been lost, or confiscated by the Qax. Parz imagined wells of magma, shaped and compressed, imploded into a stream of singularities by immense forces ... He marvelled at the earth-craft. 'It's bold, audacious, ingenious.'

'You sound proud.'

Parz shrugged. ‘Why shouldn’t I be proud? In impossible circumstances, humans have achieved a remarkable feat. Even to come so far as these rebels have—’

‘Keep your sense of perspective,’ the Qax snapped. ‘This hardly represents a serious threat to the Occupation. For all the ingenuity of its construction we are faced by a single, ramshackle raft, barely capable of maintaining its structural integrity. And it was constructed furtively, like the burrow of a hunted animal. Where is the cause for pride in that?’

‘Perhaps the rebels see themselves as hunted animals,’ Parz said.

The Qax hesitated. ‘Your admiration for these criminals is interesting,’ it said mildly.

‘Oh, you don’t need to worry,’ Parz said with vague self-disgust. ‘I talk a good rebellion. I always have. But when it comes to action, that’s a different matter.’

‘I know. I understand this feature of your personality. So did my predecessor.’

‘Am I as predictable as that?’

‘It is a factor which increases your usefulness, in our eyes,’ the Qax said.

From behind the curved flank of the Spline, another ship appeared. This, Parz saw through the Spline’s lens, was one of the craft indigenous to the period: a squat, ungainly affair, gaudily painted, hovering before the eye of the Spline like some insect. The sensors showed there was a crowd of these barges, clustered around the Interface portal. So far none of them had interfered with the Spline - or attempted to interfere, rather.

Parz said, ‘Aren’t you concerned about these local craft?’

‘They cannot harm us,’ the Qax said, sounding uninterested. ‘We can afford to take time here, to check through the Spline’s systems, before the cross-system hyperspace flight.’

Parz smiled. ‘Qax, listening to you I can hear the voice of the commander of a twentieth-century atomic carrier disdaining the painted, dugout canoes of islanders, drifting out to meet him on the curve of some sea. Still, though, the most primitive weapon can kill ...

‘And I wonder why they don’t attack anyway.’

He pressed his face to the cornea and glanced around the sky; now that he looked for them he saw how many of the strange local ships there were,

and how diverse in design. The political structure in this period was chaotic, he recalled. Fragmented. Perhaps these vessels represented many different authorities. Governments of moons, of the inner planets, of Earth herself; as well as of the central, international agencies ... Perhaps no war council coalition existed here yet; perhaps there was no one to command an attack on this Spline.

Still, Parz was irritated by the Qax's complacency.

'Aren't you at least worried that these vessels might be raising a System-wide alert? Maybe the inner planets will be able to pack more of a punch against you,' he said grimly. 'And if they're allowed to prepare ...'

'Jasoft Parz,' the Qax said with a trace of impatience, 'your death-seeking fantasies are beginning to grate. I have monitored none of the dire warnings you seem to yearn for.'

Parz frowned, absently scratching his cheek through the thick, clear plastic of his facemask. 'The situation doesn't make sense, actually, even given the political fragmentation. The Friends have been in this time period for a year. They've had plenty of time to warn the human natives of this era, to co-ordinate, assemble some sort of force to oppose you ... perhaps even to close the Interface portal.'

'There has been no evidence of such co-ordination,' the Qax said.

'No, there hasn't, has there? Is it possible the Friends haven't warned the natives? - perhaps haven't communicated with them at all, even?' Parz could still make out the Friends' craft against Jupiter, an island of green on a sea of pink. What were the rebels up to? The Friends must have had some project in mind when they made their desperate run to this period ... but evidently they had not felt the need to enlist the resources of the natives.

Parz tried to imagine how a handful of rebels on a single improvised ship could hope to strike across fifteen centuries at an interstellar power.

'It makes little difference,' the Qax murmured, its disembodied voice like an insect buzzing somewhere behind Parz's eyes. 'The second Occupation craft is minutes away from the rebel craft, now; this absurd episode is nearing its climax.'

'Michael Poole. Miriam.'

Poole dragged his eyes away from the astonishing sky. Shira stood before them; Poole saw that the customary blank composure of her skeletal face was marred by a tightness of the mouth, a pink-white flaring of her

small nostrils. Beyond her, the earth-craft was full of motion; Friends bearing slates and other pieces of equipment ran across the wiry grass, converging on the stones at the heart of the craft.

Berg snapped, ‘Shira, those are Spline warships up there.’

‘We understand what is occurring, Miriam.’

‘Then what the hell are you going to do about it?’

Shira ignored this and turned to Poole. ‘You must stay inside the tepee,’ she said. ‘The surface of the earth-craft is not safe now. The Xeelee construction material will shield you from—’

Poole said, ‘I’m not going anywhere until you tell me what you’re going to do.’

Harry, his image restored to brightness outside the hut, folded his arms and stuck his jaw out. ‘Me too,’ he said defiantly.

Shira’s voice was fragile but steady enough. ‘We are not going to respond directly to the incursion of the Qax,’ she insisted. ‘There is no purpose—’

Berg shouted, ‘You mean that after bringing them here you’re just going to let them walk in and do what they want?’

Shira flinched at the other woman’s fury, but stood her ground. ‘You do not understand,’ she said, the strain still more evident in her voice. ‘The Project is paramount.’

Harry tried to grab Poole’s arm; his fingers passed through cloth and flesh in a cloud of pixels. ‘Michael. Look at the Spline.’

The first warship had crossed the zenith now and seemed to be receding from the earth-craft. Deep in its crater-like pores Poole saw the glint of blood and metal.

The Spline’s partner, the second warship, was clear of the Interface. It was already the size of a large coin, and it grew visibly.

The second ship seemed to be coming straight for them.

‘Only two,’ Berg muttered.

Poole glanced at her, startled; her face was screwed up tight around peering eyes. ‘What?’

‘No sign of any more coming through the portal. There’s already been time for a third to start appearing.’

Poole shook his head, amazed at her ability to think her way through the looming threat from the sky. ‘Do you think something’s stopping them, at

the other end?'

Berg shook her head with a brief, dismissive jerk. 'No way. Two is all they think they need.'

Shira twisted her hands together anxiously. 'Please,' she said. 'The tepee.'

Poole ignored her. 'What do you think they're doing?'

Berg, her fear gone now, or at least suppressed, tracked the silent motion of the Spline. 'The first one's leaving Jovian space.'

Poole frowned. 'Heading where? The inner Solar System?'

'It's logical,' Berg said dryly. 'That's where Earth lies, fat and waiting.'

'And the second?'

' ... Is coming down our damn throats.'

Shira said, 'You need not fear. When the Project comes to fruition these events will be ... translated into harmless shadows.'

Poole and Berg, dropping their heads from the ugly movements in the sky, studied the Friend.

'She's crazy,' Berg said.

Shira leaned forward, her blue eyes pale and intense. 'You must understand. The Project will correct all of this. The continuance of the Project is - must be - the top priority for all of us. Including you, our visitors.'

'Even above defending ourselves - defending Earth - against a Spline attack?' Poole asked. 'Shira, this may be the best chance we'll have of defeating the assault. And—'

She didn't seem to be hearing him. 'The Project *must* be seen through,' she said. 'Accelerated, in fact.' The girl looked from one to the other, searching their faces, pleading for understanding; Michael felt as if he could see the practised phrases rolling meaninglessly through her mind. 'You will come with me now.'

'What do you think?' Poole said to Berg. 'Will they force us? Do they have weapons?'

'You know they do,' Berg said calmly. 'You saw what they did to my boat.'

'So we've no way of compelling them to do anything.' He heard the frustration, the despair in his own voice. 'They're not going to oppose the

Spline at all; they're putting all their faith in this Project of theirs. The magic Project which will solve everything.'

Berg growled softly.

She lashed out sideways with her bunched fist and caught the Friend squarely on the temple. Shira crumpled and fell to the ground where she lay with her small face fringed by pink-stained grass.

Harry, staring down, said: 'Wow.'

'She won't stay out long,' Miriam said. 'We need to move fast.'

Poole glanced up at the still-growing, rolling form of the Spline warship. 'What do we do?'

'We have to take out both Spline,' Berg muttered.

'Oh, sure,' Harry said. 'Let's take 'em both out. Or, on the other hand, why don't we think big? *I have a cunning plan ...*'

'Shut up, Harry,' Michael said absently. 'All right, Miriam, we're listening. How?'

'We'll have to split up. Harry, is the *Crab*'s boat ready to lift?'

Harry closed his eyes, as if looking within. 'Yes,' he said.

Shira stirred on the grass, moaning softly.

'Maybe you can get away in the boat,' Miriam said. 'While the Friends are still running about confused, trying to stow everything. Get back to the *Crab* and go after the first Spline, the one that's heading for Earth. Maybe you can catch it before it engages its hyperdrive.'

'And then what?'

Berg grinned tightly. 'How should I know? I'm making this up as I go along. You'll have to think of something.'

'All right. What about you?'

Berg looked up. The second Spline, advancing on the earth-craft, loomed still closer; it was a fleshy moon above them. 'I'll try to do something about that one,' Berg said. 'Maybe I can get to those singularity cannons.'

Shira moaned again and seemed to be trying to lift her face from the grass.

Poole said, 'And her?'

Berg shrugged. 'Take her with you. Maybe she'll be able to help you.'

Poole bent, picked up the girl, her protruding eyes open now and trying to focus.

Berg searched Poole's face. 'I need to say goodbye, Michael,' she said.

Harry looked from Poole, to Miriam, and back to Poole; and he winked politely out of existence.

Michael looked beyond the village of Xeelee-material huts, towards the centre of the earth-craft. Three burly Friends were running towards them. No, four. And they were carrying something. Weapons?

He turned back to Berg. 'You'll never make it to the centre of the craft,' he said. 'Come with us.'

Harry's head popped out of space, close to Miriam's ear. 'Sorry, folks,' he said, 'but you haven't a lot of time for this.'

Miriam grinned briefly, ran her hand through her stubble of hair, and took a deep breath. 'But I'm not going to the centre of the craft. Goodbye, Michael.' And she swivelled - and started to run, towards the edge of the world.

Michael Poole stood watching her for one second, mouth open.

Shira wriggled harder in his arms, kicking like a stranded fish.

There was no more time. Michael turned on his heel and ran for his boat, the ungainly burden of Shira flopping in his arms, the disembodied head of his father floating at his side.

The rim of the craft, ahead of her, was a fringe of grass, incongruous against the bruised-purple countenance of Jupiter.

Her mind raced.

From the circular village of the Friends of Wigner, Berg had about a hundred yards to run to the lip of the craft. Well, she could cover that distance in maybe ten seconds, on the flat. But the weakening of gravity as she approached the edge ought to let her speed up - as long as she didn't fall flat on her face - but on the other hand she'd be climbing out of the earth-craft's gravity well, so she'd feel as if she were running uphill ...

Yes. Already the ground seemed to be tipping up beneath her.

She tried to work with the weakening gravity, gain whatever advantage she could; she consciously slowed her pace, letting her stride lengthen and carry her further.

She risked a glance backwards. The posse of pursuing Friends had split, she saw; two of them had concentrated on Michael and the girl, and the other two were coming after her. They were fit and covered the grass fast.

They carried laser-guns, of the type which had turned her boat to slag. She imagined coherent photons surging from the weapons and arcing into her back, faster than thought. *You don't dodge a light weapon* . . . She felt her back tense, the muscles locking. Her stride faltered, and she tried to empty her head of everything but the next step.

She seemed to be climbing a one-in-three slope now. She didn't dare look back again, for fear of seeing the earth-craft apparently tip behind her, of tumbling helplessly backwards, her balance lost. And, damn it, her chest hurt. Her lungs were dragging at thinning air; coming this far out of the earth-craft's tiny gravity well was like climbing the mountains of Mars.

She wondered why the Friends didn't just open up. No need to aim; they could just hose the lasers, slice her spine the same way they'd cut open her boat. But they were hesitating. Thinking twice.

They wanted to stop her, not murder her, she realized; they were reluctant to use those weapons.

She didn't have much time for the Friends, but at least they weren't killers. Maybe it would be better if they were.

Her sense of perspective was starting to work on the approaching edge of the world, now. She could see individual blades of grass rushing towards her.

Her lungs hurt like hell. She felt her tongue protrude from her mouth. Her whole chest ached, and the muscles of her back and her upper arms. Her legs, stiffening as she climbed the steepening hill, were shivering, as if they knew what they were approaching.

She ignored it all. Her arms flailing at the thinned air, she drove her feet down into the grass, pushing the earth-craft below her.

The 'plane' continued to steepen; she was flying up a bowl-shaped Alp —

And then there was no more grass beneath her boots.

She tipped forward, stumbling over the edge of the world; her momentum carried her away from the earth-craft and into the pink light of Jovian space, arms and legs spread wide like some unlikely kite. As she spilled slowly forward she saw the posse of Friends sprawl against the grass, weapons abandoned, the thin air drawing their mouths open in cartoon masks of amazement.

She was lost in space, her lungs empty. She hung, seemingly motionless, between the earth-craft and the bulk of Jupiter. Darkness crowded the edge of her vision.

Oh Jesus, Michael, maybe this wasn't such a good plan after all.

Michael Poole, running around the edge of the earth-craft village towards his boat, arms aching with the weight of the semi-conscious Shira, was exhausted already.

He saw Berg go flying over the edge of the world. He found time to wonder if she knew what she was doing.

He glanced over his shoulder; the twist of his muscles only added to the breathless ache across his chest. Two of the Friends were still chasing him. They were close enough for him to see the mud spattered over their light pink coveralls, the set grimness of their faces, the glinting plastic of their laser-rifles ...

Harry hovered beside him, his legs whirling propeller-style in a cartoon running motion. 'I hate to be the bringer of bad news,' he panted, 'but they're gaining on us.'

'Tell me something ... I don't know.'

Harry glanced easily over his shoulder. 'Actually I don't know why they don't just lase you down where you stand.'

'Save the ... pep talk ...' Michael gasped, his shoulders and arms encased in pain, 'and ... do something!'

'Like what?'

'Use your ... initiative, damn you,' Michael growled.

Harry frowned, rubbed his chin, and disappeared.

Suddenly there were wails from Poole's pursuers, arcs of laser light above his head, the sizzle of ozone.

Still sprinting, Michael risked another look back.

A ten-foot edition of Harry, a shimmering collage of semi-transparent, fist-sized pixels, had materialized in front of the two Friends. Startled, they'd stumbled to a halt before the apparition and had let rip with the lasers. The pale pink beams lanced harmlessly through the grainy image, dipping slightly as they refracted out of the atmosphere.

But within seconds the Friends had dismissed the Virtual. Shouting to each other, they shouldered their weapons and set off once more; Harry materialized before them again and again, the basic template of his Virtual

body distorted into a variety of gross forms, but the Friends, their strides barely faltering, ran through the ineffectual clouds of pixels.

Poole tucked his head down and ran.

‘Michael!’

Poole jerked his head up. The boat from the *Crab* was speeding towards him, a gunmetal-grey bullet shape which hovered a few feet above the plane. The English grass waved and flattened beneath it. An inviting yellow light glowed from the open airlock.

Harry’s amplified voice echoed from the distant Xeelee-material buildings. ‘Michael, you’re going to get approximately one go at this ... I hope your timing is better than your stamina.’

Michael pounded across the grass, the girl an ungainly bundle in his arms. His breath scraped in his throat. The boat swept towards him at fifty miles per hour, the open hatchway gaping.

A flicker of pink-purple light above his head, a whiff of ozone, and a small hole appeared in the grey-white carapace of the boat. Smoke wisped briefly; the boat seemed to falter, but kept advancing.

It looked as if the Friends were shedding their scruples about using their weapons.

The boat filled his vision.

Poole jumped.

The doorframe caught his right shin, his left foot; pain blazed and he felt the warm welling of blood. He fell hard on the metal floor of the airlock, landing heavily on top of Shira. The girl gasped under his weight, her eyes widening. They slid in a tangle of limbs across the floor, Poole’s damaged legs leaving a trail of blood; they were jammed against the back wall of the airlock, and for the second time the air was knocked out of Poole’s labouring lungs.

A laser bolt flickered a few inches above Poole’s head.

The boat surged away from the ground, the hatch sliding closed slowly; Poole, struggling to rise, was slammed to the floor again, this time away from the girl. His chest heaved. He hadn’t been able to draw a single decent breath since his last, desperate few strides across the grass of the earth-craft, and now he felt as if he were in vacuum.

He forced his head up and looked blearily to the closing hatch. He saw a slice of salmon-pink Jupiter, a tranche of stars; already they were out of the

toy atmosphere of the earth-world, above its scrap of blue sky, rushing into Jovian space.

Blackness welled up before him. The pain in his legs stabbed through his dimming senses.

The girl moaned, sounding very far away, and he thought he heard Harry's voice. His lungs were empty. He was very cold. He closed his eyes.

Berg turned a half-somersault before the thin air slowed her tumble. Then she was falling, upside down relative to the earth-craft, gravity tugging at her so feebly it seemed as if she were hanging in the sky.

Sucking at the cold air, her arms and legs spread wide, she stared back at the earth-craft. The biggest danger with all of this - the biggest in a whole jungle of dangers, she conceded - was that she might have reached escape velocity. Would she continue to fly out into the Jovian light, her lungs straining to find the last few molecules of oxygen? She tried to taste the air, to sense if it were getting any thinner; but it was impossible to tell.

The earth-craft was laid out like a diagram before her. She was looking up at the flat, quarter-mile-wide dome of dove-grey Xeelee material which formed its base. The dome was breached by circular vents, each about a yard wide, which must be the mouths of the singularity cannon Poole had described. The dome reminded her incongruously of some old sports stadium, ripped from the Earth and hurled into orbit, upside down, around Jupiter; but on the base of this stadium sat a cluster of Xeelee-material buildings and the battered, ancient stones of a henge. Close to the edge of the landscape she could make out her two pursuers; staring after her, they clung to their floor of grass like two pink-clad flies, their weapons pinned to the sward by the inverted gravity.

Beyond the earth-craft the Spline warship climbed across the sky, Jupiter casting long, mottled spotlights onto its elephant hide.

Now there was the faintest breeze whispering past her ears as the earth-craft's weak, complex gravity field stroked her back into the artificial sky. She felt a surge of relief. Well, at least she wasn't going to die of asphyxiation, suspended carelessly over Jupiter.

The earth-craft seemed to be tipping away from her, dipping its domed section and hiding the grass-coated face from her view. Soon, even the Spline ship was hidden by its bulk.

For an odd, brief moment she was alone. She was suspended in a bubble of crisp blue sky; tufts of ragged white cloud laced the air, draping themselves over the edge of the earth-craft. It was utterly silent. It was almost peaceful. She didn't feel any fear, or regrets, she was on a roller-coaster of events now, and there wasn't much she could do except relax, roll with it, and react to whatever happened. She tried to empty her mind, to concentrate just on drawing in each painful breath.

A breeze pushed more steadily at her face now; she felt it riffle her short hair, and her loose jumpsuit billowed gently against her chest and legs.

She watched the dome more carefully, focusing on the nearest of the seemingly randomly placed singularity-cannon vents, about two hundred yards in from the rim of the craft. By measuring it against her thumbnail she saw that the vent was growing. It was like a huge opening mouth.

She found herself sighing with a small, odd regret. So much for her little interlude in the air; it looked as if the world of events was drawing her back in again.

The grey construction-material dome was looming up at her now; she was going to hit about twenty yards up from the earth-lined rim of the craft. Well, she was glad to avoid the vents for the moment; the Xeelee material was monomolecular, and she remembered the razor-sharp edges of the doorway to Shira's hut ...

The gravity on this part of the dome would be about a quarter of the earth-normal field in the interior of the craft. Enough to cause her to hit hard. She tried to orient herself in the stiffening wind, her arms and legs bent slightly, her hands held before her face.

Michael opened his eyes.

He was breathing normally. Thank God. He took a luxurious draught of thick, warm air.

He was inside the metal box that was the boat's airlock. The floor felt soft below him ... too soft. He probed beneath him with his right hand, and found the metal floor a few inches below his spine; inadvertently he shoved himself a little further into the air.

Weightlessness. They'd made it into space.

When he turned his head, his shoulders, chest and neck still ached from their labours in the thin air of the earth-craft. Beside him Shira was curled into a question mark, the diffuse light of the airlock bathing the elegant

dome of her head. Her face looked very young in her sleep. Trickles of blood, meandering in the weightless conditions, snaked from her ears.

Poole lifted cautious fingers to his own face. Blood at his nose and ears. And the sudden movement made him rock in the air; his hovering legs dangled and banged together, and the pain from his damaged shins and feet flared anew. He cried out, softly.

Harry's face popped into being just in front of his own. 'You're alive,' Harry said. 'Awake, as a matter of fact.'

Poole found his voice reduced to an ugly scratch. 'Great timing, Harry. Why didn't you run it a bit closer?'

Harry's eyebrows raised a little. 'Piece of cake,' he said.

'Let me sleep.' Michael closed his eyes.

'Sorry. We dock with the *Crab* in one minute. Then we've got to get out of here. We're assaulting a mile-wide sentient warship from the future. Or don't you remember the plan?'

Michael groaned and shut his eyes tighter.

Berg's hands, feet and knees hit the unyielding surface first. The construction material was slick, smoother than ice, a shock of sudden cold against her palms. She let her hands and feet slide away from beneath her. She turned her face away so that her chest and thighs hit the surface comparatively softly.

She lay spreadeagled, flattened against the dome. She lay for a few minutes, the breath hissing through her teeth, her chest flat against the cold Xeelee substance.

She'd had worse landings.

The light changed. She lifted her head. Once more the Spline was rising over the curved horizon of the dome, a malevolent moon of flesh, cratered by eyes and weapon snouts.

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11

Harry’s voice was strained. ‘Michael. The Spline is attacking the earth-craft.’

Michael Poole, the *Crab*’s two gravities heavy on his chest, lay on a couch. The subdued lights of the *Crab*’s lifedome were comfortingly familiar all around him.

Above him, directly ahead of the advancing *Crab*, the Spline they had chosen to chase loomed like a misshapen face, growing perceptibly. Other ships orbited the Spline in a slow, complex gavotte. The whole tableau was almost pleasing to watch; peaceful, silent.

Poole felt tired, his capacity to absorb change exhausted. Lying here was almost like the precious days when he had sailed alone through the Oort Cloud.

The girl Shira, on a couch beside Poole’s, her frail frame crushed by the two-gravity thrust, wept softly. Poole turned to her reluctantly. Her face was gaunt. There was moisture under her eyes, her nose, patches of colour in her cheeks; her eyes were like red wounds. Harry’s disembodied head floated in shadow some feet above them both, no expression readable.

‘Damn it,’ said Poole. ‘Harry, bring up an image of the earth-craft.’

A section of the dome turned opaque, hiding the Spline and its ineffectual human attendants; the opaque section filled with a salmon-pink wash, an inverted slab of grass-green, a ball of hull-flesh. The little cup-shaped earth-craft, dwarfed, hung beneath the belly of the attacking warship like some absurd pendant; and it hung with its grassy face averted, its construction-material dome turned up to the Spline in submission. Cherry-red fire flickered from the gut of the Spline, dimming Jupiter’s light. The earth-craft shuddered visibly.

‘Starbreakers,’ Shira breathed, eyes wide. ‘The Spline is using starbreakers.’

‘What did you expect?’ Poole said grimly. ‘Can the Xeelee material withstand starbreaker beams?’

‘I don’t know. Perhaps for a while. The earth-craft isn’t a warship, Michael.’

Poole frowned. In the magnified and enhanced image on the dome the singularity-cannon portals were obvious breaches in the ship’s armour.

Presumably the causality stress was still impairing the Spline's power and accuracy. But if the Spline managed to shoot through one of those portals it would be over, no matter how tough this magical Xeelee substance was.

Suddenly there was smoke, flames erupting from one of the cannon mouths. The light was an intense blue, heavily loaded to the ultraviolet. Poole, used to the silent flickering of light and particle weapons, felt weak, awed. Two points of light, intensely bright and whirling around each other, shot out of the cannon and spiralled along the column of smoke and light towards the patient bulk of Jupiter.

Harry said, 'What the hell was that?'

'Singularities,' Poole breathed. 'I can scarcely believe it. They're working their cannon; they've fired off two of their singularities. The Friends are fighting back. Maybe Berg—'

'No.' Shira's face, though damp with weeping, was composed. 'It's the Project. They are proceeding with the Project.' Her eyes were bright, seemingly joyful, as she stared upwards.

Starbreaker light flared. Overloaded, the lifedome turned black, the image imploding, then cleared once more.

Now, above Poole's head, the Spline he was chasing was turning, weapon pits glinting menacingly.

'I think they've spotted us,' Harry said.

The belly of the Spline closed down on the earth-craft like a lid. The nearest cannon-mouth was still yards away.

Berg threw herself flat against the construction-material dome. Hull-flesh rolled above her, silent and awesome, like the palm of some giant hand. Metal artefacts large enough to be artillery pieces stared down at her. Now a huge wounded area swept over her, an inverted pool of blood and disrupted flesh. Something swam in that thick, oil-like blood, she saw: symbiotic organisms - or constructs - patiently tending to the worst of the damage. With acres of charnel-house meat suspended over her head, she found herself gagging; but, of course, there was no smell, no sound; the Spline was still outside the atmosphere of the earth-craft.

Would Xeelee construction material stop the weapons of a Spline warship? Maybe not. But it sure would help ...

She had to get inside the dome.

Trying to ignore the looming ceiling of flesh, she slithered on her belly towards the hole in the dome.

She was too slow, too damn slow. After a few seconds she stopped, rested her face against the dove-grey cheek of Xeelee material.

This was ridiculous. Crawling wasn't going to make a difference, one way or the other; it could only slow her down.

Muttering encouragement to herself, keeping her eyes off the nightmare filling the sky, she pushed herself up to a kneeling position, got her legs under her, stood uncertainly.

As if in response cherry-red brightness burst all around her; the dome shuddered like a living thing. She was thrown to her face.

Then, when the singularity cannon fired, Berg's body actually rattled against the shuddering Xeelee material. She pushed herself away from the dome, leaving smears of blood from her nose, her bruised mouth.

She got to her feet. There was a stink of ozone; a wind pressed at her chest, weak in the thin air. Twin points of light - which must be singularities - climbed a tube of smoke into the pink-stained sky. The points whirled around each other like buzzing fireflies. She gave a hoarse cheer: at last, it seemed, the good guys were fighting back ...

But then she saw that the smoke tube the singularities were climbing almost grazed the surface of the dome; it passed neatly through the gap between the dome and the lumbering belly of the Spline and arced towards Jupiter.

The Friends weren't trying to attack the Spline, to defend themselves; they were firing their singularities at Jupiter. Even at a time like this, all they cared about was their damn Project.

'Assholes,' Berg said. She started running.

Ignoring the pain of the thinness of the atmosphere in her lungs, the heady stench of scorched air, the buffeting winds, the shuddering dome, she tried to work out what she'd do when she got to the mouth of the cannon. The tubes were about three feet wide, and she'd have about twenty yards to fall to the inner base of the dome; she could probably slide through the first few yards and then use her hands and feet to brake—

Starbreaker light flared hellishly all around her. Abandoning all conscious plans, she wrapped her arms around her face and dived head-first into the cannon tube.

Even though the Spline's weapon-ports must be open now - even though the warship from the future must look like some fleshy wall across the sky, massive and menacing, to the natives of this era - a lone matchstick craft was coming at them out of the flotilla of ships, flaring along a two-gee curve straight for the Spline.

Jasoft Parz could hardly believe it.

The ship was about a mile in length. Its drive-fire plumed from a block of comet-ice; the block was fixed to a long, delicate, open-frame metal stalk, topped by a clear lifedome. The dome was a pool of subdued light; Jasoft could almost imagine he could see humans moving about in it, actual people.

Jasoft recognized the design from the research he'd performed for the dead Governor. This was a GUTship, driven by the phase energy of decoupling super-forces. It looked so *fragile.*

Something moved in Jasoft, lost and isolated as he was in the grotesque eyeball of the Spline.

There had to be something he could do to help.

He pushed away from the lens. With short, heavy strokes through the thick entoptic fluid, he cast about the eye chamber, looking for some way to damage his Spline host.

Berg rattled down the translucent singularity-cannon tube.

The barrel seemed to be sheltering her from the blazing red light of the starbreaker assault, but its surface proved to be slick and unyielding; neither her hands nor her feet could gain any kind of purchase on the walls of the tube. So she kicked out at the walls as she collided with them, jamming herself as hard as she could against them: anything to generate a little friction. She knew the lower mouth of the tube was six feet above the crystalline floor of the inner chamber. Berg tried to twist in the tube so she'd land butt-first, protecting her head and arms—

She plummeted out of the cannon.

The plane of singularities, diamond points in a lattice of blue-white light, rushed to meet her, slammed into her back.

For long seconds she lay there spreadeagled, staring up at the Xeelee-material dome. Cherry-red light glimmered in distant cannon mouths.

She gingerly moved her legs, wiggled her fingers. There was a cacophony of pain, but nothing seemed to be broken. Her lungs, back and

chest felt like a single mass of bruises, though; and it was hard to expand her lungs, to take a decent breath.

It felt nice to lie here, she thought, just to lie here and to watch the light show ...

Starbreaker light flared anew beyond the dome - no, she realized with a shock; now it was shining *through* the dome - and as she watched Xeelee construction material blistered, bubbling like melting plastic.

She'd postpone blacking out until later, she decided.

She rolled over and climbed painfully to her feet, ignored the clamouring stiffness, the pain in her legs and chest.

The hollow heart of the earth-craft was a hive of activity. Friends ran everywhere carrying bits of equipment, working control panels, shouting instructions to each other. But there was no chaos, or panic, Berg saw. The Friends knew exactly what they were doing. The scene had something of the air of a great installation - a power plant, perhaps - in the throes of some crisis.

In the commotion no one seemed to have observed her unorthodox entrance. There was damage around her, evidence of the huge Spline assault; close to her there was a burned-out control console, two young, gaunt bodies splayed over it.

A cannon-tube flared, forcing her to shield her eyes; a pair of singularities hurtled out of the plane beneath her feet, dazzled up into a cannon tube and soared beyond the dome like ascending souls. She felt the plane beneath her shudder as the whole craft recoiled from the launch of so much mass.

And now there was a rush of noise above her, like the exhalation of a giant. She glanced up. The damaged area of the dome was beginning to glow white-hot; around a quarter of the dome was sagging, losing its structural integrity under the sustained Spline assault.

There was a smell of burning.

Berg recognized a man - a boy, really - the Friend Jaar, who'd taken Poole on his sightseeing tour of this place. Jaar was working at the centre of a little group of Friends, poring over slates which bore what looked like schematics of singularity trajectories. There was soot, blood smeared over his bare scalp, and his jumpsuit was torn, begrimed; he looked tired, but in control.

In a few strides Berg crossed the chamber. She forced her way through the knot of people and grabbed Jaar's arm, pulling away his slate so he was forced to look at her.

Irritation, hypertension crossed his face. 'Miriam Berg. How did you get in here? I thought—'

'I'll explain later. Jaar, you're under attack. What are you doing about it?'

He pulled his arm away from her. 'We are finishing the Project,' he said. 'Please, Miriam—'

She grabbed his shoulders, twisted him round so he was forced to face her. 'Look above your head, damn it! The Spline is using starbreakers. The whole damn roof is going to implode on you, Xeelee material or not. There's not going to be time to finish your precious Project. *You're going to fail*, Jaar, unless you do something about it.'

Wearily he indicated the frantic motion around them. 'We set up a crash schedule for the implementation of the Project, but we're falling behind already. And we've lost lives.' He looked up; he seemed to flinch from the failing dome.

'Why don't you use the hyperdrive?'

'The hyperdrive has already gone,' Jaar said. 'Its components were stored in the structure of the dome; we lost operability soon after the start of the assault—'

'Jesus.' Berg ran stiff fingers through her hair. So there was no way to run; they could only fight. And she wouldn't be fighting merely for the good of humanity, but for her own life ... 'All right, Jaar; show me how these damn singularity cannons work.'

Jasoft Parz felt rather proud of himself.

He wasn't a scientist, or an engineer, by any stretch of the imagination. But, he was finding, he wasn't completely without resource.

In his life-support box he'd found a spare skinsuit. Using a sharp edge from the box he'd sliced this apart, assembled it into a little tepee-like tent; the substance of the skinsuit, trying to restore its breached integrity, had sealed itself tight along the new seams he'd created.

He'd fixed the little tent over a Spline nerve-trunk and used the facemask of the skinsuit to pump the tent full of breathable air, creating a little bubble of atmosphere in entoptic fluid.

Now he cast through the contents of the life-support box. Maybe he'd have to take the mechanism apart, to start his fire ...

The Spline warship hung over the lifedome of the *Hermit Crab*, rolling with abrupt, jerky, mechanical motions.

Michael Poole stared at it with something approaching fascination: quite apart from its dominating physical presence there was a vague obscenity about the mixture of gross, swollen life and mechanical deadliness. Michael was reminded of myths of the past, of the undead.

No wonder Earth had been - would be - held in thrall by these things.

Michael glanced at Shira. The Friend, exhausted, dishevelled, crushed by the GUTdrive's continuing two-gravity push, lay flat on the couch next to his. Her eyes were open - staring up - but unseeing. A clean blue glow flickered at the edge of his vision, somewhere close to the perimeter of the lifedome.

Harry's disembodied head drifted like a balloon. 'What was that?'

'Verniers. Attitude jets.'

'I know what verniers are,' Harry grumbled. The head swivelled theatrically to peer up at the Spline. The huge sentient warship was now drifting away from the *Crab*'s zenith. 'You're turning the ship?'

Michael leaned back in his couch and folded his hands together. 'I preset the program,' he said. 'The ship's turning. Right around, through one hundred and eighty degrees.'

'But the GUTdrive is still firing.' The head glanced up at the Spline again, closed one eye as if judging distances. 'We must be slowing. Michael, are you hoping to rendezvous with that thing up there?'

'No.' Michael smiled. 'No, a rendezvous isn't in the plan.'

'Then what is, for Christ's sake?'

'Look, Harry, you know as well as I do that this damn old tub isn't a warship. Apart from a couple of Berry-phase archaeological scanners, I've nothing apart from the ship itself which I can use as a weapon.' He shrugged, lying there. 'Maybe if I'd brought back a few more samples from the Oort Cloud, I could throw rocks—'

'What do you mean,' Harry asked ominously, '"apart from the ship itself "?'

'After all this two-g thrust we've a huge velocity relative to the Spline. When we've turned around there'll be only a couple of minutes before we

close with the Spline; even with the GUTdrive firing we'll barely lose any of that ...

'Do you get it, Harry? We're going to meet the Spline ass-first, with our GUTdrive blazing—'

With slow, hesitant movements, Shira raised her hands and covered her face with long fingers.

'My God,' Harry breathed, and his Virtual head ballooned into a great six-feet-tall caricature. 'We're going to ram a Spline warship. Oh, good plan, Michael.'

'You've got a better suggestion?'

An image flickered into existence on the darkened dome above them: the Spline warship, as seen by the *Crab*'s backward-pointing cameras. The gunmetal grey of the Spline's hull was reflected in Harry's huge, pixel-frosted eyes. 'Michael, as soon as that Spline lines itself up and touches us with its damn starbreaker beam, this ship will become a shower of molten slag.'

'Then we'll have died fighting. I say again: have you got a better suggestion?'

'Yes,' said Harry. 'Your first idea. Let's run back out to the cometary halo and find some rocks to throw.'

Beyond Harry's huge, translucent head the Spline's motion seemed to have changed. Michael squinted, trying to make out patterns. Was the rolling of the warship becoming more jerky, more random?

Come to think of it, he'd expected to be dead by now.

Was there something wrong with the Spline?

A quarter of the dome had caved in. Cannon barrels collapsed gracefully. Xeelee construction material shrank back like burning plastic, and through the breaches Miriam could see the harsh glare of the stars, the flicker of cherry-red starbreaker light.

Molten construction material rained over the singularity plane. Friends scurried like insects as shards - red-hot and razor-sharp - sleeted down on them. A wind blasted from the devastated area through the rest of the chamber; Miriam could smell smoke, burning flesh.

'Jesus,' Miriam breathed. She knew she was lucky; the singularity-cannon console she'd been working at with Jaar was well away from the collapsing area. Jaar cried out inarticulately and pushed away from the

console. Berg grabbed his arm. ‘No!’ She pulled him around. ‘Don’t be stupid, Jaar. There’s not a damn thing you can do to help them; the best place for you is here.’

Jaar twisted his head away from her, towards the ruined areas of the earth-craft.

Now a flare of cherry-red light dazzled her. The Spline had found a way through the failed dome and had hit the chamber itself with its starbreaker beam. Raising her hand to shield her eyes from the glow of the dome, she saw that the crystal surface over one section of the singularity plane had become muddied, fractured; cracks were racing across it as if it were melting ice. The area had been scoured of human life. And the singularities themselves, white-hot fireflies embedded in their web of blue light, were stirring. Sliding.

All around the artificial cavern the Friends seemed to have lost their discipline. They stumbled away from their consoles, clung to each other in distracted knots; or they ran, hopelessly, into the devastated area. The singularity-cannon muzzles were silent now; sparks no longer sailed upwards to space.

The Friends were finished, Berg realized.

Berg released Jaar and turned back to the console. She tried to ignore it all - the stench of meat, the wind in her face, the awesome creak of disintegrating Xeelee construction material - and to think through the layout of this cannon control. It was all based on a straightforward touch-screen, and the logic was obvious. Tapping lightly at coloured squares she ran through the direction-finder graphics.

From the corner of her eye she saw schematic diagrams of the earth-ship - huge swaths of the dome-base glaring red - and graphs, lists of figures, data on more subtle damages.

Berg said, ‘How bad is it? Are we losing the air?’

Jaar watched her, distracted, his face crumpling in pain. ‘No,’ he said, his voice a hoarse shout above the chaotic din. ‘The breaches in the dome are above the bulk of the atmosphere; the singularity plane’s gravity well will keep most of the air in a thick layer close to the surface ... for the next few minutes anyway. But the air will seep out of that breach. It will absorb all this heat, boil out of the ruined shell ... and the dome itself may fail further.’

‘All right. Tell me about the singularity plane.’

He looked vaguely at the console and lifted a desultory hand, tapped almost casually at the touch-screen. ‘We’ve lost control of about thirty per cent of the singularities. The integrity of the restraining electromagnetic net is gone.’

Berg frowned, tried to work it out. ‘What does that do to us?’

‘We didn’t run any simulations of this scenario.’ He turned to face her, the sweat on his scalp glistening in the starbreaker light. ‘This is a catastrophic failure; we have no options from this point. The loose singularities will attract each other, swarm together. The n-body computations would be interesting ... The singularity swarms will eventually implode, of course.

‘It’s over.’ His shoulders shook convulsively in their thin covering of begrimed, pink material.

She stared at him. She had the feeling that, just at this moment, Jaar - broken open as he was - would be prepared to tell her anything she wanted to know about this damn Project: that all the questions which had plagued her in the months since she’d fallen ass-first into the laps of these Friends of Wigner would at last be settled ... ‘Jesus, I wish I had time for this.’ She glared at the console before her, lifted her hands to the touch-screen - but the configuration was different. Blocks of light slid about as she watched; the damn thing was changing before her eyes. ‘Jaar, what’s happening?’

He glanced down briefly, barely interested. ‘Compensation for the lost singularities, ’ he said. ‘The mass distribution will continue to change until the disrupted singularities settle down to some form of stable configuration.’

‘All right.’ She stared at the shifting colour blocks, striving to take in the whole board as a kind of gestalt. Slowly she started to see how this new pattern matched the matrix she’d memorized earlier, and she raised her hands hesitantly to the screen—

Then the shifting, the seemingly random configuring, started again.

She dropped her hands. ‘Damn it,’ she said. ‘Serves me right for thinking this was going to be easy.’ She grabbed Jaar’s arm; he looked down at her with an expressionless face. ‘Listen, Jaar, you’re going to have to come back out of that shell of yours and help me with this. I can’t manage it myself.’

‘Help you with what?’

‘With firing a singularity.’

He shook his head. It was hard to be sure, but it seemed to Berg that he was almost smiling at her, patient at her ignorance. ‘But there’s no point. I’ve already explained that without the thirty per cent we’ve lost, we can’t complete the Project—’

‘Damn you,’ she shouted over the rising wind, ‘I’m not planning to fire these things into Jupiter! Listen to me. I want you to help me fight back against the Spline ...’

He shook his head, clearly confused and frightened, trying to pull away from her.

‘What is it with you people? I know your Project was more important than your own damn life, but the thing has failed now! Why won’t you help me keep you alive?’

He stared at her, as if she was speaking a language he no longer understood.

There was a groan, like the cry of some huge animal. She glanced up, cringing; acres of dome were glowing white-hot now, vast sections peeling back to reveal the stars. Xeelee material dangled like scraps of burnt skin.

She might only have seconds left, she realized, before the control systems failed completely - or all the power failed, and she found herself playing billiards with a thousand uncontrolled, city-block-sized black holes - or the damn roof fell in ...

And she was going to have to waste those seconds holding this guy’s hand. ‘Jaar,’ she shouted, ‘your Project is finished. The only way it could succeed, in the future, is for you to start again. To construct new singularities, build a new earth-ship. But the options are limited. We can’t run, because the hyperdrive is slag, along with the Xeelee dome. So all we can do is fight. Jaar, you have to help me fight back. We have to destroy the Spline, before it destroys us.’

Still he stared at her emptily, his mouth drooping open.

In frustration she drove her fist into his arm. ‘It’s for the Project, Jaar. *The Project*. You’ve got to live, to find a way to start it all again. You see that, don’t you? Jaar?’

More of the dome imploded into spinning fragments; starbreaker light flickered.

Jasoft Parz was shaken around his eyeball chamber like a pea in a cup. Bits of his broken-open life-support kit bounced around at the end of his umbilical cord like some ludicrous metal placenta. But the walls of the chamber were fleshy, yielding; and he was cushioned further by entoptic fluid.

It was almost fun.

The life-box was a depressing sight. He'd stripped out so many components in his search for a way to ignite his little bonfire - not to mention bleeding half his air supply away to feed the flames - that he couldn't believe it would sustain him for much longer than a few more minutes.

He doubted it made much difference, now, whatever the outcome of this brief, intense battle; he could see no way he personally was going to be allowed to live through this.

It didn't seem to matter. He hadn't felt as calm in years.

His improvised oxygen-tent was still holding up, despite the buffeting and turbulence of the entoptic fluid; sparking electrical fire sizzled against the raw nerve of the Spline; he must be flooding the nervous system of the disoriented creature with agony. Through the Spline's clouding lens he saw sheets of cherry-red light, lines of fire which seemed to crackle across space. The starbreaker beams were firing at the incoming GUTship, then. But he could see how wild the firing was, how random.

For the first time he allowed himself to suppose that this might actually work.

'Jasoft Parz.' The Qax's synthesized translated voice was, Parz noted with amusement, still as level and empty of meaning as a software-generated travel announcement ... but it masked a scream of rage. 'You have betrayed me.'

Jasoft laughed. 'Sorry about that. But what did you expect? Who would have thought that a Spline warship would be so easy to disable ... provided you're in the right place, at the right time. In any event, you're wrong. The truth is that you have betrayed yourself.'

'How?'

'By your insufferable complacency,' Parz said. 'You were so convinced of a simple victory here. Damn it, Qax, I would have emerged from that portal with all guns blazing - hit these men from the past before they

understood what was happening! But not you - even despite the fact that you *knew* the Wigner Friends could have prepared resistance to you ... And, even worse, you carried me - a human, one of the enemy - in your warship's most vulnerable place; and for no other reason than to heighten the exquisiteness of your triumph. Complacency, Qax!'

'The Spline is not yet rogue,' the Qax said. 'Its pain-suppression routines are not designed to deal with the damage you have inflicted. But, within seconds, heuristic routines will eliminate the disruption. And, Jasoft Parz, you may anticipate the arrival of antibody drones, to deal with the cause of the damage—'

'I'm weak with terror,' Parz said dryly. Beyond the clouding lens-window of his bathysphere-like cell, comet-ice gleamed, rushing at him; GUTfire blazed like sunlight. 'But I don't think we've got even seconds left, Qax.'

The Spline, engulfed by pain, closed its huge eyelid.

A cannon tube, suspended from the damaged dome, extended downwards; at last its mouth touched the crystalline flooring beneath Berg's feet and merged with it, seamlessly. Two firefly singularities moved imperceptibly closer to the cannon barrel, as if eager to be launched into space. Berg felt the gravity field within which she was embedded alter, subtly; it was like an earth tremor, and it gave her a sensation of falling in the pit of her stomach.

She turned to Jaar. 'Listen to me,' she said rapidly. 'Here's what we're going to do. I want you to reconfigure this damn thing to launch a singularity pair, so that the peak of the trajectory is inside the Spline. But that's not all. *I want the singularities to merge*, just at the second in which they are lodged at the heart of the Spline. Do you understand?'

Jaar looked at her, at first without apparent understanding. Then he got it. His eyes narrowed.

'How quickly can you do it?' she asked.

'Watch me.'

The collision, when it came, was almost balletic.

GUTdrive fire blistered great swaths of the Spline's writhing flesh; Michael found himself shrinking back from the bloody, carnal acres above his head. But still the Spline seemed to find it impossible to respond; those

bizarre cherry-red beams, lightspeed rents in spacetime, continued to lance out - but it fired at random, consistently missing the *Crab*.

‘There’s something wrong,’ Harry breathed. ‘It should have sliced us open by now. Why hasn’t it?’

And now the *Crab* entered the Spline itself, its burning GUTdrive breaching the elephant-flesh hull. Creation light boiled away blood, flesh in a vast, obscene, soundless explosion; the Spline’s huge body seemed to recoil. At last the comet-ice tail of the *Crab* disappeared, still glowing, into the carcass of the Spline.

There was a cloud of motion around the huge wound; Michael squinted to see.

‘Little robots,’ Harry said, amazed.

‘Antibody drones,’ said Shira lifelessly; she stared at the scene with dull fascination.

Harry said, ‘The robots are damaging our hull. We’re under attack. For the first time.’

‘Maybe,’ said Poole. ‘But I don’t think it really matters now.’

The star-core glow of the GUTdrive was extinguished at last, killed by the toiling antibody drones. But still the mass of comet-ice, the long, crumpling body of the *Crab*, slid steadily into Spline flesh.

It was almost sexual, Michael thought.

The singularity shot, with its reduced launch velocity, seemed to crawl up the translucent cannon shaft. Berg had absurd visions of the singularities rolling out of the mouth of the barrel, falling back to the crystal floor with an anti-climactic plop—

The singularities reached the mouth of the cannon shaft and soared out of sight, eclipsed by the Xeelee-material dome of the chamber.

Berg’s energy seeped out of her, now that it was done - for better or worse. She clasped the console, feeling her legs sagging under her.

Purple-red light flared silently through the cracks in the shattered dome. The Spline’s deadly starbreaker beams flickered, died.

All over the devastated earth-craft Friends turned their faces up to the uncertain glow, oddly like flowers to the Sun.

Half the dome was gone now. Beyond it, the Spline blocked out the stars.

Its starbreaker beams stilled, the huge warship rolled across the impassive sky. An immense, bloody crater - covering fully an eighth of the Spline's surface area - deformed its hull, Berg saw; and she couldn't help but wince in sympathy. And, as the Spline rolled, she realized that the crater was matched by a second - if anything, even deeper - at the ship's opposite pole. Weapon-navels pooled with blood. The Spline's roll across the stars was erratic, as if some internal balance system was failing.

'Implosion wounds from the directional gravity waves,' said Jaar, his voice calm, evaluating. He nodded thoughtfully. 'It worked.'

Berg closed her eyes. She sought feelings of triumph. Even of relief. But she was still stranded on a damn eggshell that would probably fall apart spontaneously, without any more help from the Spline. And, lest she forget, there was a merged mini-black hole, its devastating work on the Spline complete, falling out of the sky towards her ...

She said, 'Come on, Jaar, you beautiful bastard. If we're going to live through this we've still got work to do—'

The Spline imploded.

The GUTdrive module drove into its heart like a stiletto. Muscles convulsed in compression waves which tore through the body of the Spline like seismic events. All over the surface of the ship vessels exploded, spewing fast-freezing fluids into space.

The Qax was silent.

Jasoft Parz clung to nerve cables; the eye chamber rolled absurdly as the Spline sought escape from its agony. Parz closed his eyes and tried to *feel* the suffering of the Spline - every spasm, every bursting vessel.

He had been brought here to witness the destruction of Earth. Now he was determined to witness the death of a Qax, embedded in the consciousness of the Spline; he tried to sense its fear at the encroaching darkness, its frustration at its own mistakes, its dawning realization that the future - of Jim Bolder, the Qax diaspora - would, after all, come to pass.

Failure, and death.

Jasoft Parz smiled.

The *Crab* had come to rest at last, its tail section buried in the ravaged heart of the Spline. The lifedome, perched on the crumpled shaft of the ship, overlooked the Spline's carcass like, Michael thought, a viewing platform over some ghastly resort of blood and ripped flesh.

He lay on his couch, the tension draining out of him. Shira, beside him, even seemed to be asleep.

‘I need a shower,’ he said.

‘Michael.’ Harry’s Virtual head hovered at the edge of the dome, peering out. ‘There’s something out here.’

Michael laughed. ‘What, something other than a wrecked sentient warship from the future? Surprise me, Harry.’

‘I think it’s an eyeball. Really; a huge, ugly eyeball, yards wide. It’s come out of its socket; it’s drifting at the end of a kind of cable ... an optic nerve extension, maybe.’

‘So?’

‘So I think there’s somebody inside.’ Harry grinned. ‘I think he’s seen me. He’s waving at me ...’

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12

Michael Poole followed Jasoft Parz, the strange bureaucrat from the future, through the entrails of the dead Spline.

They worked their way through gravity-free darkness broken only by the shifting, limited glow of the light-globe Parz had rescued from his bizarre eyeball-capsule; the semi-sentient device trailed Parz, doglike. The corridor they followed was circular in cross-section and little more than head-high. Poole's hands sank into walls of a greyish, oily substance, and he found himself worming his way past dark, floating ovals a foot or more wide. The ovals were harmless as long as he avoided them, but if he broke the crusty meniscus of any of them a thick, grainy blood-analogue flowed eagerly over his suit.

'Jesus,' he muttered. 'This is disgusting.'

Parz was a few yards ahead of him. He laughed, and spoke in his light, time-accented English. 'No,' he said. 'This is life aboard the finest interstellar craft likely to be available to humans for generations to come - even after my time.' Parz was a thin, dapper man of medium height; his receding hair was snow white and his face was gloomy, downturned, his chin weak. He looked, Michael thought, like a caricature of an aging bureaucrat - a caricature saved only by his striking green eyes. Parz, in his clear, skin-tight environment suit, moved more easily through the claustrophobic, sticky conditions than did Poole in his bulky space-hardened gear; but Poole, watching Parz slide like a fish through the cloacal darkness, found himself relishing the cool dryness inside his own suit.

A fleshy flap a yard square opened in the floor of this tunnel-tube. Poole jumped back with a cry; ahead of him Parz halted and turned. Fist-sized globes of blood-analogue came quivering out of the flap, splashing stickily against Poole's legs, and then out shot an antibody drone - one of the little robots which seemed to infest the carcass of this damn ship. This one was a flattened sphere about a foot across; it shot from wall to wall, rebounding. Then, for a moment, the drone hovered before Poole; tiny red laser-spots played over Poole's shins and knees, and he tensed, expecting a lance of pain. But the laser- spots snapped away from him and played over the walls and blood-globules like tiny searchlights.

The drone, jets sparkling, hurtled off down the passageway and out of sight.

Poole found himself trembling.

Parz laughed, irritatingly. ‘You shouldn’t worry about the drones. That one was just a simple maintenance unit—’

‘With lasers.’

‘It was only using them for ranging information, Mr Poole.’

‘And they couldn’t be used for any more offensive purposes, I suppose.’

‘Against us? The drones of this Spline are thoroughly used to humans, Mr Poole. It probably thinks we’re part of a maintenance crew ourselves. They wouldn’t dream of attacking humans. Unless specifically ordered to, of course.’

‘That cheers me up,’ Poole said. ‘Anyway, what was it doing here? I thought you said the damn Spline was dead.’

‘Of course it is dead,’ Parz said with a trace of genteel impatience. ‘Ah, then, but what is death, to a being on this scale? The irruption of your GUTdrive craft into the heart of the Spline was enough to sever most of its command channels, disrupt most of its higher functions. Like snapping the spinal cord of a human. But - is it dead?’ Parz hesitated. ‘Mr Poole, imagine putting a bullet in the brain of a tyrannosaurus. It’s effectively dead; its brain is destroyed. But how long will the processes of its body continue undirected, feedback loops striving blindly to restore some semblance of homeostasis? And the antibody drones are virtually autonomous - semi-sentient, some of them. With the extinguishing of the Spline’s consciousness they will be acting without central direction. Most of them will simply have ceased functioning. But the more advanced among them - like our little visitor just now - don’t have to wait to be told what to do; they actively prowl the body of the Spline, seeking out functions to perform, repairs to initiate. It’s all a bit anarchic, I suppose, but it’s also highly effective. Flexible, responsive, mobile, heuristic, with intelligence distributed to the lowest level ... A bit like an ideal human society, I suppose; free individuals seeking out ways to advance the common good.’ Parz’s laugh was delicate, almost effete, thought Poole. ‘Perhaps we should hope, as one sentient species considering another, that the drones find tasks sufficient to give their lives meaning while they remain aware.’

Poole frowned, studying Parz's round, serious face. He found Jasoft Parz oddly repellent, like an insect; his humour was too dry for Poole's taste, and his view of the world somehow over-sophisticated, ironic, detached from the direct, ordinary concerns of human perception.

Here was a man, Poole thought, who has distanced himself from his own emotions. He has become as alien as the Qax. The world is a game to him, an abstract puzzle to be solved - no, not even that: to be admired dustily, as one might marvel at the recorded moves of some ancient chess game.

No doubt it had been an effective survival strategy for someone in Parz's line of work. Poole found pity in his heart for the man of the future.

Parz, proceeding ahead of Poole along the tunnel, continued to speak. 'I've never been aboard a dead Spline before, Mr Poole; I suspect it could be days before the normal functions close down completely. So you'll continue to see signs of life for some time.' He sniffed. 'Eventually, of course, it will be unviable. The vacuum will penetrate its deepest recesses; we will witness a race between corruption and freezing ice ...' He hesitated. 'There are other ships in the area who could take us off? Human ships of this era, I mean.'

Poole laughed. 'A whole flotilla of them, flying every flag in the System. A damn lot of use they've been.' The navies had been arriving in strength. But the key battles had been over in minutes, long before most of the inner System worlds were even aware of the invasion from the future. But, Poole had learned, the space battles had made spectacular viewing, projected live in huge Virtuals in the skies of the planets ... 'We've asked them to hold off for a few more hours, until we finish this investigation; we wanted to make sure this thing was safe - dead - deactivated - before letting anyone else aboard.'

'Oh, I think it's safe,' Parz said dryly. 'If the Spline could still strike at you, be assured you'd be dead by now. Ah,' he said. 'Here we are.'

Abruptly the vein-like tunnel opened out around Jasoft. He drifted into empty space, his light-globe following patiently. The white light of the globe shone feebly over the walls of a cavern which Poole, peering carefully from the tunnel, estimated to be about a quarter-mile across. The walls were pink and shot through with crimson veins as thick as Poole's arms; blood-analogue still pulsed along the wider tubes, he noticed, and

quivering globes of the blood substance, some of them yards across, drifted like stately galleons through the darkness.

But there was damage. In the dim light cast by the globe-lamp, Poole could make out a spear of metal yards wide which lanced across the chamber, from one ripped wall to another: the spine of the embedded *Crab*. The lining of the chamber had done its best to seal itself around the entrance and exit wounds, so that a tide of flesh lapped around the *Crab*'s spine at each extremity. And even now Poole could see the fleeting shadows of drones - dozens of them - drifting around the spine, sparking with reaction jets and laser-light as they toiled, too late, to drive out this monstrous splinter. Poole stared up at the immense intrusion, the huge wounds, with a kind of wonder; even the spine's straight lines seemed a violation, hard and painfully unnatural, in this soft place of curved walls and flesh.

He unwrapped a line from his waist and fixed one end to the pulsing wall of the chamber. As the jaws of the clip bit, Poole found himself wincing, but he forced himself to tug at the clip, feeling its strong teeth tear a little into the Spline's flesh, before trusting himself to push away from the wall after Parz.

Parz, propelled by a compact reaction-pack built onto the spine of his skinsuit, swam with a stiff grace around the chamber. His suit was slick with gobbets of blood-analogue, Poole noticed, giving Parz the odd and obscene appearance of something newborn. 'This is the stomach-chamber,' Parz said. 'The Spline's main - ah, hold, if you will. Where the Qax customarily reside. At least, the Occupation-era Qax I have described; the turbulent-fluid beings.'

Poole glanced around the dim recesses of the space; it was like some ugly, fleshy cathedral. 'I guess they needed the elbow room.'

Parz glanced across at Poole. His green eyes glimmered, startling. 'You shouldn't be surprised to feel uncomfortable, moving through this Spline, Mr Poole. It's not a human environment. No attempt has been made to adapt it to human needs, or human sensibilities.' His face seemed to soften, then, and Poole tried to read his expression in the uncertain light. 'You know, I'd give a lot to see the Spline of a few centuries from now. From my time,' he corrected himself absently. 'After the overthrow of the Qax, when human engineers adapt the Splines for our own purposes. Tiled vein-corridors; metal-walled stomach-chambers ...'

‘The overthrow of the Qax?’ Poole asked sharply. ‘Parz, what do you know?’

Parz smiled dreamily. ‘Only what I was told by the Governor of Occupied Earth ... The second Governor, that is. Only what it told me of the future, when it was convinced I would die before seeing another human.’

Poole felt the blood pulse in the veins of his neck. ‘Jasoft, for the first time I’m glad I rescued you from that ridiculous eyeball.’

Parz turned away. Half-swimming, he made his way towards one section of the stomach-chamber wall, some way from the areas violated by the irruption of the *Crab*. He came to rest beside a metal canister, a coffin-sized box which was fixed to the fleshy wall by a web of metal strands.

‘What is it?’ Poole asked. ‘Have you found something?’ He made his way clumsily across the deserted space of the chamber towards Parz.

The two of them huddled over the box, the light-globe hovering close; the small tent of light cast over them was strangely intimate. Parz ran quick, practised hands over the box, fingering touch-screens which, Poole noticed, refused to light up. Parz’s face was quite clear to Poole, but his expression was neutral. Unreadable.

Parz said, ‘“Look on my works, ye mighty, and despair.”’

‘What?’

‘This is Qax.’ He slapped the box with one gloved palm. ‘The Governor of Earth. Dead, harmless ...’

‘How?’

‘The Qax preferred to run their Spline craft by direct conscious control, with their own awareness alongside the continuing sentience of the Spline.’

Poole frowned. ‘Can’t have been comfortable for the Spline.’

‘The Spline didn’t have much choice,’ said Parz. ‘It’s an efficient method. But not without its risks.

‘When the collision with your ship terminated the Spline’s higher functions, perhaps the Qax could have disengaged. But it didn’t. Driven by its hatred - and, perhaps, by hubris, right to the end - it stayed locked inside the Spline’s sensorium. And when the ship died, the Qax died with it.’

Poole fingered the metal webbing, thoughtfully. ‘I wonder if the Spline could be salvaged, somehow. After all, the hyperdrive alone is worth centuries of research. Maybe we could link up the *Crab*’s AI to what’s left of the Spline’s functions.’

Parz frowned. ‘But if the Qax’s method is any guide, you need a sophisticated conscious entity as a front end, something which can feel its way into what’s left of the Spline’s - identity. Sympathetically. Do you understand?’

Poole nodded, smiling. ‘I think so. And I know just the conscious entity to try it.’

Parz was silent for a moment. His gloved fingers stroked the surface of the metal canister almost tenderly, and he seemed to be rocking back and forth in the thick intestinal air. Poole leaned closer, trying to read Parz’s expression; but the half-shadowed face, with its mask of age tightened by AS, was as empty as it had ever been. ‘Jasoft? What are you thinking?’

Parz looked up at him. ‘Why,’ he said with a note of surprise, ‘I think I’m mourning.’

‘Mourning a Qax?’ A creature, thought Poole, whose fellows had turned Earth’s cities to glass - who would have, given a little more fortune, scraped humanity out of the Solar System before most people had even learned the name of their destroyers - and who had turned Parz himself into a quisling, a man unable even to face his true self ... ‘Jasoft, are you crazy?’

Parz shook his head slowly; folds of the clear skinsuit creased at his neck. ‘Poole, one day humans are going to bring about the destruction of the Qax’s home world. We’ll almost wipe them out.

‘ ... But they’re *unique*. There are only - have only ever been - a few hundred of them. Yet each one has the seed of immortality - the potential to live long enough to witness star-corpses shine by proton decay.

‘Poole, this is the second Qax I’ve seen die.’ Parz bent his head to the metal case, apparently looking inward. ‘Yes,’ he said. ‘Yes, I’m mourning.’

Poole stayed with him in the silence of the dead Spline.

Miriam Berg, Jaar at her side, walked into the devastated heart of Stonehenge.

The ground had been ripped open, wadded into thick furrows; grass clung to the broken turf like hair to flesh. And the ancient stones had been scattered, shivered to rubble by the casual brush of a gravity-wave starbreaker beam.

Jaar touched her shoulder and pointed into the sky, towards the bulk of Jupiter. ‘Look up there,’ he said.

Miriam stared hard along the line of his long arm, squinting with the effort. There was a shadow: a rough rectangle silhouetted against the gaudy pink of Jupiter, turning slowly as it sailed away from the earth-craft. ‘The last of the henge,’ she said.

‘Well, at least one of the old stones has survived. It will sail around Jupiter for a hundred thousand years, perhaps.’

Berg shook her head. ‘Damn it. I should feel happier, I guess. We’ve saved the human race! ... But what a cost.’

Jaar inclined his head towards her with awkward tenderness. ‘Miriam, I think the first builders of this old henge - had they been able to imagine it - would have been happy with such a monument as that orbiting menhir.’

‘Maybe.’ Miriam looked around at what was left of the earth-craft. The Xeelee-material huts of the Friends had been flattened like canvas tents in a gale; she could see Friends picking sadly through the debris. Although the earth-craft’s essential life-support equipment had survived inside the singularity-plane chamber, she knew that most of the Friends’ personal possessions had been abandoned up here during the assault: their records of families and places lost fifteen centuries in the future - much that made life worth living from day to day, when there was time for less weighty concerns than the fate of the universe.

Berg found herself shivering; her chest and lungs - which had not healed properly following her leap out to the edge of the atmosphere during the attack - ached dully, a constant, brooding presence. And the air of the craft was noticeably thinner, now. The weakening of the earth-craft’s gravity field, as generated by the devastated plane of singularities, was marked; in some places the craft had been rendered virtually uninhabitable. The Friends’ latest estimate was that fully forty per cent of their stock of singularities had been fired or lost while the Spline starbreakers had riffled through the craft’s defences like fingers through paper. Many of the singularities launched before Berg had made it into the dome had hit their primary target. Jupiter, it seemed, had probably been seeded with enough singularities to cause its ultimate implosion, and - one day, centuries away - there would be a single, spinning singularity on the site now occupied by the greatest planet. But the singularity wouldn’t be of the right size, or the right spin, or whatever the hell were the mysterious criteria of success the

Friends had laid down for themselves. And now there weren't enough singularities left for them to finish the job.

'So,' she said to Jaar. 'What next, for the Friends of Wigner?'

He smiled a little wistfully, his large, fragile-looking head swivelling as he surveyed the battered earth-craft. 'The craft has suffered too much damage to remain habitable for long—'

'Atmosphere leakage?'

He looked at her. 'Yes, but more significantly the loss of the hyperdrive when the construction-material dome was crushed—' He closed his long fingers into a fist. 'And without the hyperdrive we have no effective radiation shielding. This skimpy blanket of atmosphere will scarcely suffice to protect us in Jovian space, and I doubt if we could survive even one close encounter with the Io flux-tube.'

'Right.' Berg looked up at the sky nervously; suddenly her situation - the fact that she was standing on a lump of rock, lost in orbit around Jupiter, *with nothing over her head but a few wisps of gas* - seemed harshly real; the sky seemed very close, very threatening.

'We'll have to evacuate, of course,' Jaar said stiffly. 'We will accept assistance from your contemporaries, Miriam. If we may.'

'You needn't fear,' she said as kindly as she could. 'I'll speak to Michael, if you'll let me; he can intercede with the authorities. There are plenty of ships in the area.'

'Thank you.'

'And then what, Jaar?'

'Then we go on.' His brown eyes were pale and intense and filled once more with unshakable faith; she found herself returning his gaze uncomfortably. 'We find a way to resume the Project.'

'But, Jaar—' She shook her head. 'Your Project has nearly brought disaster down on us all already. Hasn't it? You mustn't lose sight of this simple fact, my friend - *we were lucky to defeat the Qax invasion from the future*. If they hadn't been so slow to react, so complacent, so sure we posed no threat to them - then they could have destroyed the race. Is your Project worth such a risk again?'

Jaar replied with intensity, 'Berg, your words in the singularity chamber, at the height of the struggle with the Spline - that I must survive, in order to fight another day, to continue with the Project - changed me, convinced me.

Yes, the Project is worth all of that. It's worth any risk - believe me, *any price*.'

'Look, I said all that when the roof was caving in. Literally. It was a ploy, Jaar. I was trying to manipulate you, to get you to fight, to make you do what I wanted you to do.'

'I know that.' He smiled. 'Of course I know that. But the motives behind your words don't reduce their truth. Don't you see that?'

She studied his long, certain face, and wrapped her arms closely around her, troubled.

Harry Poole, downloaded into the nervous system of the Spline, was in agony.

Jesus Christ . . .

The Spline's body and sensorium encased him like the inside of his own (corporeal) head. He felt its vast, intimidating bulk all around him; the toughened outer flesh-hull felt as if it were third-degree burnt; the pits for weapons and sensors felt like open wounds.

The Spline must be in constant, continual pain, he realized; yes, they had been adapted for survival in space and hyperspace, but clumsily, he saw now. He felt like an amputee, nerve ends crudely welded to steamhammers and jacks.

Was this a price worth paying, even for species longevity? ... And the Qax must have endured this horror, too. Then again, he thought, perhaps pain had a different meaning for one as alien as a Qax.

The shock of Poole's crude attack had been enough to kill the Spline. The pain Harry suffered now was like the agony of a new birth into a universe of darkness and terror.

... And yet, as he became accustomed to the size and scale of the Spline, to the constant howl of pain, Harry became aware of - compensating factors.

Some of his sensors - even some of the Spline's ancient, original eyes, like the one ravaged by Jasoft Parz - still worked. He saw the stars through the eyes of a sentient starship; they were remote yet accessible, like youthful ideals. He could still turn; the Spline could roll. Vast, hidden flywheels of bone moved somewhere inside him, and he felt the centrifugal wrench of rotation as if the stars themselves were rolling around him, tugging.

And, burning like a fire in his gut, he felt the power of the hyperdrive. Cautiously he flexed those strange, indirect muscles; and he thrilled at the power he could direct - the power to unravel the dimensions of spacetime itself.

Yes, there was grandeur in being a Spline.

He opened pixel-eyes inside the lifedome of the wrecked *Crab*. His son was staring up at him. ‘I can fly,’ Harry said.

Jasoft Parz had shed his skinsuit, snakelike; now he floated in the air, one of Michael’s roomier dressing gowns billowing around him. ‘From what your companion Berg reports, these Friends of Wigner sound determined to revive their Project.’

Michael Poole lay back in his couch in the *Crab*’s lifedome and steepled his fingers behind his head. ‘But the Friends are going to need access to singularity-manufacturing technology on an industrial scale, if they are to rebuild their earth-craft. And that surely means keeping the Interface access to the future open. We simply don’t have the infrastructure for such an endeavour, in this time period.’

Harry, his huge Virtual head floating in the air above Poole’s couch, nodded wisely. ‘But then we’re leaving the door unlocked against whatever else the Qax choose to throw down their wormhole pipe at us. Not to mention any companions of Miss Splendid Isolation over there.’ He nodded towards Shira; the girl sat at a data console scrolling idly through some of Michael’s research results, studiously ignoring the conversation.

Parz said, ‘The Qax were utterly complacent in their invasion of this time-frame. And so - perhaps - no message, no report of the disaster, was sent back through the Interface to the future. But the Qax Occupation authorities will surely send through more probes, to investigate the outcome. We have bought time with our victory, but nothing more, as long as the Interface remains open.’

Shira looked up. ‘Are you so sure you can close the portal?’ she asked quietly. ‘You designed it, Michael Poole; you must know that spacetime wormholes are not hinged hatches one can open and close at will.’

‘We’ll find a way, if we have to,’ Michael said seriously.

‘And if the Qax, or the Friends of the future, choose not to allow it?’

‘Believe me. We’ll find a way.’

Parz nodded, his green eyes narrowing. ‘Yes. But perhaps we should begin considering now how to do such a thing. We may need the option rapidly, should we decide to use it - or should it become necessary to do so.’

Harry opened a pixel-blurred mouth and laughed. ‘In case of emergency, break laws of physics.’

‘Start working on it, Harry,’ Michael said wearily. ‘Shira, it’s not impossible. Wormholes are inherently unstable. Active feedback has to be built into the design, to enable a hole to endure ...’

But Shira had turned away again and was bent over her data. In the semi-darkness of the lifedome, with her face lit from beneath by the pink-blue glow of Poole’s old data, her eyes were huge and liquid.

She was shutting them out once more.

‘If only the Friends would let us in on their secret,’ Michael said, half to himself. ‘Then perhaps we could assess the risks, analyse the potential benefits against the costs of allowing them to go ahead.’

‘But they won’t,’ Harry said. ‘All they’ll tell us is how the Project will make it all right in the end.’

‘Yes,’ Parz said. ‘One senses from their words that it is as if the Project will not merely justify any means, any sacrifice - but will somehow *nullify the sacrifice itself*, in its development.’ He looked at Michael. ‘Is that possible?’

Michael sighed, feeling very tired, very old; the weight of centuries pressed down on him, evidently unnoticed by the Virtual of his father, by this faded bureaucrat, by the baffling, enigmatic girl from fifteen centuries away. ‘If they won’t tell us what they’re up to, maybe we can try to work it out. We know that the core of the Project is the implosion, the induced gravitational collapse of Jupiter, by the implanting of seed singularities.’

‘Yes,’ Parz said. ‘But there is a subtle design. We know already that the precise form of that collapse - the parameters of the resulting singularity - is vital to the success of the Project. And that’s what they hoped to engineer with their singularity bullets.’

Harry frowned hugely. ‘What’s the point? One singularity is much like another. Isn’t it? I mean, a black hole is black.’

Michael shook his head. ‘Harry, a lot of information gets lost, destroyed, when a black hole forms from a collapsing object. A black hole forming is like an irruption of disorder into the universe. But there are still

three distinguishing quantities associated with any hole: its mass, its electrical charge and its spin.'

A non-rotating, electrically neutral hole, Michael said, would have a spherical event horizon - the Schwarzschild solution to Einstein's ancient, durable equations of general relativity. But a rotating, charged object left behind a Kerr-Newman hole: a more general solution to the equations, a non-spherical horizon.

Parz was performing gentle, weightless somersaults; he looked like a small, sleek animal. 'Kerr-Newman predicts that if one may choose mass, charge and spin, one may sculpt event horizons.'

Harry smiled slowly. 'So you can customize a hole. But my question still stands: so what?'

'One could go further,' Parz said, still languidly somersaulting. 'One could construct a naked singularity.'

'A *naked* singularity?'

Michael sighed. 'All right, Harry. Think of the formation of a hole again: the implosion of a massive object, the formation of an event horizon.

'But, *within* the event horizon, the story isn't over yet. The matter of the dead star keeps imploding; nothing - not pressure from the heat of the core, not even the Pauli exclusion principle - can keep it from collapsing all the way.'

Harry frowned. 'All the way to what?'

'A singularity. A flaw in spacetime; a place where spacetime quantities - mass/energy density, space curvature - all go off the scale, to infinity. Inside a well-behaved black hole, the singularity is effectively cloaked from the rest of the universe by the event horizon. The horizon renders us safe from the damage the singularity can do. But there are ways for singularities to form *without* a cloaking event horizon - to be "naked". If a star is spinning rapidly enough before its collapse, for instance ... Or if the mass distribution is not compact enough in the first place - if it is elongated, or spiky.

'The singularity in such a solution wouldn't be a point, as would form at the centre of a spherically symmetric, non-rotating star. Instead, the material of the star would collapse to a thin disc - like a pancake - and the singularity would form within the pancake, and along a spike through the axis of the pancake - a spindle of flawed spacetime.

‘The naked singularity would be unstable, probably - it would rapidly collapse within an event horizon - but it would last long enough to do a lot of damage—’

Harry frowned. ‘I don’t like the sound of that. What damage?’

Poole locked his hands behind his head. ‘How can I explain this? Harry, it’s all to do with *boundary conditions* ...’

Spacetime could only evolve in an orderly and predictable way if its boundaries, in space and time, were themselves orderly. The boundaries had to satisfy what were called ‘Cauchy conditions’; causality itself could only flow from stable Cauchy boundaries.

There were three types of boundary: in the beginning there was the initial singularity - the Big Bang, from which the universe expanded. That was one boundary: the start of time.

Then there were boundaries at infinity: *spacelike infinity* contained all the places infinitely remote from the observer ... and then, far ahead, at *timelike infinity*. At the end of all worldlines.

The initial singularity, and the boundaries at spacelike and timelike infinity, were all Cauchy boundaries ...

But there was another class of boundary.

Naked singularities.

‘It sounds fantastic,’ Harry said.

‘Maybe it is. But nobody can think of any reason why such objects shouldn’t form. There are some quite easy ways for this to happen, if you wait long enough. You know that black holes aren’t really “black”, that they have a temperature—’

‘Yes. Hawking evaporation. Just like the holes in the earth-craft.’

‘Small holes like those in the earth-craft’s singularity plane will simply implode when they have evaporated completely. But in the far future, when the singularities at the heart of galaxy-mass holes begin to emerge from within their evaporating horizons ...

‘Harry, naked singularities are *non-Cauchy boundaries* to spacetime. There is no order, no pattern to the spacetime which might evolve from a naked singularity; we can’t make any causal predictions about events. Some theorists hold that if a naked singularity were to form then spacetime - the universe - would simply be destroyed.’

‘Jesus. Then maybe they can’t form after all?’

‘You should have been a philosopher, Harry.’

‘I should?’

‘That’s the principle of Cosmic Censorship - that there’s something out there, something like the Pauli principle maybe, which will stop the formation of naked flaws. That’s one theory.’

‘Yeah. But who is this Cosmic Censor? And can we trust him?’

‘The trouble is that we can think of too many ways for naked singularities to be formed. And nobody can think of a particularly intelligent way for Cosmic Censorship to come about ...’

Parz, hovering, had listened to all this with eyes closed. ‘Indeed. And perhaps that is the goal of the Friends.’

Michael felt the pieces of the puzzle sliding around in his head. ‘My God,’ he said softly. ‘They’ve hinted at a power over history. Do you think they could be so stupid?’ He looked up at the Virtual. ‘Harry, maybe the Friends are trying to change history using a naked singularity ...’

‘But they could never control it,’ Parz said, eyes still closed. ‘It would be utterly random. At best, like lobbing a grenade into a political discussion. It will change the agenda, yes, but in an utterly discontinuous fashion. And at worst—’

‘At worst they could wreck spacetime,’ Michael said. Harry looked down at him, serious and calm. ‘What do we do, Michael? Do we help them?’

‘Like hell,’ Michael said quietly. ‘We have to stop them.’

Shira looked up from her data screens, her long neck seeming to uncoil. ‘You don’t understand,’ she said calmly. ‘You’re wrong.’

‘Then you’ll have to explain it to me,’ Michael said tiredly. ‘Harry, do you have that option I asked for?’

Harry’s smile was strained. ‘We can close the Interface, the AIs say. But I don’t understand how. And I don’t think you’re going to like the solution.’

Michael felt an enormous weight, oppressive, seeming to strive to crush his chest. ‘I don’t like any of this. But we’re going to do it anyway. Harry, start when you can.’

He closed his eyes and lay back on the couch, hoping for sleep to claim him. After a few seconds the surge of the Spline’s insystem drive pressed him deeper into the cushions.

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13

At the zenith, the Interface portal was a tiny, growing flower of electric blue. The Spline ship was already within the thousand-mile region of exotic space, the squeezed vacuum which surrounded the wormhole mouth.

Jasoft Parz settled, birdlike, onto the deck in the new artificial gravity of the Spline drive; he took a seat and watched Michael closely, his green eyes sharp, fascinated.

Shira got out of her chair and walked unsteadily across the deck. Her eyes were huge, bruised, the shape of her skull showing through her thin flesh. ‘You must not do this,’ she said.

Michael began, ‘My dear—’

Harry cut in, ‘Michael, we’re in the middle of a storm of messages. I’m surprised the hull of the dome hasn’t burned off under comm-laser fire ... I think you’ll have to deal with this. All the ships within a thousand miles are aware we’re moving, and a dozen different authorities want to know what the hell we’re doing.’

‘Can any of them stop us before we reach the Interface?’

Harry considered. ‘Probably not. The Spline, even disabled as it is, is so damn big it would have to be blown out of the sky to be stopped. And there’s no armour heavy enough to do that, in range.’

‘Okay. Ignore them.’

‘And we’re getting messages from the earth-craft,’ Harry reported. ‘Also inquiring politely as to what we think we’re doing.’

Shira’s hands twisted together. ‘You must listen to them, Michael.’

‘Answer me honestly, Shira. Can the Friends do anything to stop us?’

Her mouth worked and her eyes seemed heavy, as if she could barely restrain hysterical tears; and Michael felt an absurd, irrational urge to comfort her. ‘No,’ she said at last, quietly. ‘Not physically, no. But—’

‘Then ignore them too.’ Michael thought it over. ‘In fact, Harry, I want you to disable the whole damn comms panel ... Any equipment the Spline is carrying too. Permanently; I want you to trash it. Can you do that?’

Again a short hesitation. ‘Sure, Michael,’ Harry said uncertainly. ‘But - are you sure that’s such a good idea?’

‘Where we’re going we’re not going to need it,’ Michael said. ‘It’s just a damn distraction. In,’ he studied the zenith, ‘what, forty minutes?—’

‘Thirty-eight,’ Harry said gloomily.

‘—we’re going to enter the Interface. And we’re going to close it. And there’s nothing more anybody can say that will make a bit of difference to that.’

‘I’m not going to argue,’ Harry urged, ‘but - Michael - *what about Miriam?’*

‘Miriam’s a distraction,’ Michael said firmly. ‘Come on, Harry, do it. I need your support.’

There was a silence of a few seconds. Then: ‘Done,’ Harry said. ‘We’re all alone, Michael.’

‘You are a fool,’ Shira told Michael coldly.

Michael sighed and tried to regain a comfortable posture on his couch. ‘It’s not the first time I’ve been called that.’

‘Might be the last, though,’ Parz said dryly.

‘You think you are solving the problem, with one bold, audacious stroke,’ Shira said, her water-blue eyes fixed on Michael’s face. ‘You think you are fearless, in the face of unknown dangers - an encounter with the future, even with death. But you are not fearless. You are afraid. You fear even *words*. You fear the words of your contemporaries - how many lectures have I endured on how important it was that we should allow you into our confidence ... that we should share the immense problems with which we grappled? And now you - as arrogant as you are foolish - turn your back even on your own kind. You fear the words of the Friends themselves - even of me - you fear the logic, the *truth* in our convictions.’

Michael massaged the bridge of his nose, wishing he didn’t feel so damned tired. ‘Quite a speech,’ he said.

She drew herself upright. ‘And you fear yourself. For fear of your own weakness of resolve, you dare not even consider the possibility of consulting the one closest to you, Miriam, who is less than a light-second away. You would rather, as you put it, “trash” your comms equipment than —’

‘Enough,’ Michael snapped.

She drew back a little at the sharpness of his tone, but she held her ground; pale eyes glittered from her bony face.

Michael said, ‘To hell with any of that. It’s academic, Shira. The rules have changed; the outside universe might as well not exist as far as what

happens to this ship from now on is concerned; we've established that. There's only the four of us now - you, me, Parz and Harry—'

'—and several hundred drones,' Harry put in uncertainly, 'who I'm having a certain amount of difficulty controlling—'

Michael ignored him. 'Just the four of us, Shira, in this bubble of air and warmth. And the only way this ship is going to get turned aside is if you - *you* - convince me, and the others, that your Project is worth the incalculable risk it entails.' He studied her, trying to gauge her reaction. 'Well? You have thirty-eight minutes.'

'Thirty-six,' Harry said.

Shira closed her eyes and drew in a deep, shuddering breath. 'All right,' she said. She crossed the deck to her chair, her gait stiff and ungainly, and sat down.

Michael, watching her, felt himself come alive with anticipation, rejuvenated by the prospect of having his questions answered at last.

Shira talked to them of Eugene Wigner, and of the von Neumann catastrophe.

Like the alive-dead condition of Schrödinger's cat, events remained in a state of unreality until observed by a conscious observer. But each act of observation merely added another layer of potentiality to the core events, themselves unrealized until observed in turn.

The chains of quantum functions, in Wigner's view, extended to infinity in an unending chain, an infinite regress.

'Thus, the paradox of Wigner's friend,' Shira said.

Michael shook his head impatiently. 'But this is pure philosophical debate,' he said. 'Wigner himself believed that the regress was not infinite ... that the chain of wave-functions terminates as soon as a conscious mind makes an observation.'

'That is one view,' Shira said quietly. 'But there are others ...'

Shira described the theory of the 'participatory universe'.

Life - intelligent life - was, under this hypothesis, essential for the very existence of the universe. 'Imagine a myriad of box-cat-friend chains of quantum functions, all extending through time, without end. Constantly,' Shira said, 'life - consciousness - is calling the universe into existence by the very act of observing it.'

Consciousness was like an immense, self-directed eye, a recursive design developed by the universe to invoke its own being.

And if this were true, the goal of consciousness, of life, said Shira, must be to gather and organize data - all data, everywhere - to observe and actualize all events. For without actualization there could be no reality.

Arising from a million chance beginnings, like the stirring of the chemical soup of Earth's ancient seas, life had spread - was continuing to spread - and to observe, to gather and record data using every resource available.

'We live in an era somewhere near the start of the contact between species, on an interstellar scale,' Shira said. 'There is war, death, destruction, genocide. But one can, from a Godlike perspective, regard it all as interfacing - as a sharing, a pooling, of information.

'Ultimately, surely, the squabbling species of our day will resolve their childish differences - differences of special prejudice, of narrow interests, of inadequate perception - and move together, perhaps under the leadership of the Xeelee, towards the ultimate goal of life: the gathering and recording of all data, the observation and invocation of the universe itself.'

More and more resources would be devoted to this goal - not just in extent, as life spread from its myriad points of origin, but in depth and scope. At last all the energy sources available for exploitation, from the gravitational potential of galactic superclusters down to the zero-point energy inherent in space itself, would be suborned to the great project of consciousness.

Shira described the future of the universe.

In a few billion years - a blink of cosmic time - Earth's sun would leave the Main Sequence of stars, its outer layers ballooning, swallowing the remains of the planets. Humanity would move on, of course, abandoning the old in favour of the new. More stars would form, to replace those which had failed and died ... but the formation rate of new stars was already declining exponentially, with a half-life of a few billion years.

After about a thousand billion years, no more stars would form. The darkened galaxies would continue to turn, but chance collisions and close encounters would take their cumulative toll. Planets would 'evaporate' from their parent suns, and stars would evaporate from their galaxies. Those stars remaining in the time-ravaged star systems would lose energy, steadily, by

gravitational radiation, and coalesce at last into immense, galactic-scale black holes.

And those holes themselves would coalesce, into holes on the scale of galactic clusters and superclusters; from all across the universe the timelines would converge, merging at last into the great singularities.

But life would prevail, said Shira, continuing to exploit with ever-increasing efficiency the universe's residual sources of energy. Such as the dim shining of the star-corpses, kept at a few degrees above absolute zero by the slow decay of protons.

And there would still be work to be done.

Black hole evaporation would continue, with the eventual shrinking and disappearance of event horizons even on the scale of galaxies and clusters of galaxies; and naked singularities would emerge into the spreading sweep of spacetime.

Perhaps the universe could not exist beyond the formation of a naked singularity. Perhaps the formation of such a flaw would cause the cessation of time and space, the ending of being.

'And perhaps,' Shira said, 'life's purpose, in the later stages of the evolution of the universe, is to manipulate event horizons in order to prevent the formation of naked singularities.'

'Ah.' Parz smiled. 'Another elegant idea. So our descendants might be retrained to work as Cosmic Censors.'

'Or as Cosmic Saviours,' Michael said dryly.

Harry asked, sounding awed, 'How do you manipulate event horizons?'

'No doubt there are lots of ways,' Michael said. 'But even now we can imagine some fairly crude methods. Such as forcing black holes to merge before they get a chance to evaporate.'

'The Wigner paradox is inescapable,' Shira said. The chains of unresolved quantum states would build on and on, growing like flowers, extending into the future, until the observations of the cosmos-spanning minds to come would rest on aeon-thick layers of history, studded with the fossils of ancient events. 'At last,' Shira said, her voice steady and oddly flat, 'life will cover the universe, still observing, still building the regressing chains of quantum functions. Life will manipulate the dynamic evolution of the cosmos as a whole. One can anticipate the pooled resources of life

exploiting even the last energy resource, the sheer energy of the expansion of spacetime itself ...

‘Consciousness must exist as long as the cosmos itself - for without observation there can be no actualization, no existence - and, further, consciousness must become coextensive with the cosmos, in order that *all* events may be observed.’

Parz laughed softly, wondering. ‘What a vision. Girl, how old are you? You sound a thousand years old.’

But, Shira went on, the chains of quantum functions would finally merge, culminate in a final state: at the last boundary to the universe, at timelike infinity.

‘And at timelike infinity resides the Ultimate Observer,’ Shira said quietly. ‘And the last Observation will be made—’

‘Yes,’ Parz said, ‘and so collapsing all the chains of quantum functions, right back through time - through the wreckage of the galaxies, down to the present and on into history, past Wigner, his friend, the cat and its box - what a charming notion this is—’

‘Retrospectively, the history of the universe will be actualized,’ Shira said. ‘*But not until the final Observation*.’ For the first time since resuming her seat she turned to Michael. ‘Do you understand the implications of this, Michael Poole?’

He frowned. ‘These ideas are staggering, of course. But you’ve gone one step further, haven’t you, Shira? There’s still another hypothesis you’ve made.’

‘I ... Yes.’ She bowed her head in an odd, almost prayerful attitude of respect. ‘It is impossible for us to believe that the Ultimate Observer will simply be a passive eye. A camera, for all of history.’

‘No,’ Michael said. ‘I think you believe that the Ultimate Observer will be able to *influence* the actualization. Don’t you? You believe that the Observer will have the power to study all the nearly-infinite potential histories of the universe, stored in the regressing chains of quantum functions. And that the Observer will select, actualize a history which is - what?’

‘Which is simply the most aesthetically pleasing, perhaps,’ Parz said in his dry, aged way.

‘Which maximizes the potential of being,’ Shira said. ‘Or so we believe. Which makes the cosmos through all of time into a shining place, a garden free of waste, pain and death.’ She lifted her head abruptly. Michael was moved by the contrast between the skeletal gauntness of the girl’s intense face and the beauty - the power, the wistfulness - of her concepts.

Harry said, his voice heavy with wonder, ‘A god at the end of time. Is it possible?’

Michael found he wanted to reach the girl, and he tried to put tenderness into his voice. ‘I understand you now, I think,’ he said. ‘You believe that none of this - our situation here, the Qax occupation of Earth, the Qax time-invasion - is real. It’s all transitory, in a sense; we are simply forced to endure the motion of our consciousness along one of the chains of quantum functions which you believe will be collapsed, discarded, by your Ultimate Observer, in favour of—’

‘Heaven,’ Harry said.

‘No, nothing so crude,’ Michael said. He tried to imagine it, to look beyond the words. ‘Harry, if she’s right, the ultimate state - the final mode of being of the cosmos - will consist of global and local optimization; of the maximizing of potential, everywhere and at every moment, from the beginning of time.’ Shining, Shira had said. Yes, shining would surely be a good word for such an existence ... Michael closed his eyes and tried to evoke such a mode; he imagined this shoddy reality burning away to reveal the grey light of the underlying optimal state.

Tears prickled gently at his closed eyes. If one were vouchsafed a glimpse of such a state, he thought, then surely one would, on being dragged back to the mire of this unrealized chain of being, go insane.

If this was the basis of the faith of the Friends, then no wonder the Friends were so remote, so intense - so careless of their everyday lives, of the pain and death of others. History as it existed was nothing more than a shabby prototype of the global optimization to come, when the Ultimate Observer discarded all inferior worldlines.

And no wonder then, he thought, the Friends were so leached of humanity. Their mystical vision had removed all significance from their own lives - the only lives they could experience, whatever the truth of their philosophy - and it had rendered them deeply flawed, less than human. He opened his eyes and studied Shira. He saw again the patient intensity which

resided inside this fragile girl - and he saw now how damaged she was by her philosophy.

She was not fully alive, and perhaps never could be; he pitied her, he realized.

‘All right, Shira,’ he said tenderly. ‘Thank you for telling me so much.’

Parz sighed, almost wistfully; his small, closed face showed a refined distress. ‘But she hasn’t yet told us all of it. Have you, girl?’ With an edge in his voice, he went on, ‘I mean, if you truly believe such a wondrous vision - that the history we have lived through, the present and future we must endure - are merely prototypes for some vast, perfect version which will one day be imposed on us from the end of time - then what is the Project all about? Why do you need to do anything to change your condition in the here-and-now? Why not simply endure this pain, let it end, and wait for it all to be put right at the end of things?’

She shook her head. ‘In my time, humans are helplessly subjugated to the Qax. We were able to assemble the resources for our rebellion, but it was only the fortuitous arrival of your ship from the past which gave us the opportunity to do so.

‘Such a rebellion could never happen again. Michael Poole, we believe the Qax Occupation will result, at last, in the decline of man. The Qax - inadvertently, perhaps - will destroy humanity. And thereby they will terminate all possible timelines in which humanity survives the Occupation Era, joins the greater, maturing community of species which is to come, and adds to the wisdom of those mighty races at the end of time. The Qax will stop the transmission of any data about what humans were and might have been into the future. This is a crime on the largest of scales - and would be worth opposing even if we were not of the species affected ...

‘But we are. And we believe we have to thwart the Qax, to safeguard the future role of humanity.’

Poole pulled his lip. ‘Jasoft, what do you make of this diagnosis?’

Parz spread his hands. ‘She may be right. The Qax of my era weren’t planning for our destruction before this disastrous sequence of events, ironically initiated by the Friends themselves - we’ve been too useful, economically. But perhaps in the end, we could not have survived an extended subjugation ...

‘And, looking ahead, we know that Shira’s prediction must come true, but in ways she could not anticipate. The human Jim Bolder will cause the destruction of the Qax home world, drive them to diaspora. After this, it seems, the elimination of humanity will become a racial goal for the Qax.’

Poole nodded; he’d studied Shira’s reactions throughout this discourse, but her face was blank, unreacting, blandly pretty. *She’s not listening*, he realized. *Perhaps she can’t.*

‘Very well. Then, Shira, tell us how turning Jupiter into a black hole will help you achieve your aims. Is the singularity to be some form of super-weapon?’

‘No,’ Shira said calmly. ‘Such is not our intention. Not directly.’

‘No,’ said Michael, staring at the girl. ‘You’re not weapons-manufacturers, or warriors. Are you? I think you see yourself as part of the great upwards streaming of life, towards this marvellous, cosmic future you’ve described. I think you want to preserve something. Information of some kind. And send it beyond the current perilous era into this distant, glorious future, when those wise Observers of the universe will pick up your message and understand its true meaning.’

Parz was staring at him, baffled.

Michael said, ‘Jasoft, I think they are turning Jupiter into a vast time capsule. They’re constructing a black hole; a black hole which will evaporate in - what? Ten to power forty, fifty years from now? Jupiter will be like a vast tomb, timed to open. A naked singularity will be exposed. These cosmic engineers, these tinkerers with the dynamic evolution of the universe, will come to investigate; to extinguish the peril exposed to the universe and its future/past.’

‘Ah.’ Jasoft smiled. ‘And when they do come, they will find a message. A message left for them by the Friends.’

Harry laughed. ‘This conversation gets more and more bizarre. What will this message say? How do you strike up a conversation with god-like cosmic designers ten to power forty years in the future? “Hello. We were here, and had a hell of a lot of trouble. What about you?”’

Michael smiled. ‘Oh, you might be a bit more imaginative than that. What if you stored the human genome in there, for instance? The future consciousness could reconstruct the best of the race from that. And with a bit of tinkering you could store the “message” in the consciousness of the

reconstructed humans. Imagine that, Harry; imagine emerging from some fake womb, with your head full of memories of this brief, glorious youth of the universe - and into a cosmos in which the formation, life and death of even the last, shrivelled star is a memory, logarithmically distant ...'

Shira smiled now. 'There is no limit, given the technology,' she said. 'One could imagine converting an Earth-mass to data, lodging it within the event horizon. One would have available ten to power sixty-four bits - equivalent to the transcription of ten to power thirty-eight human personalities. Michael, one might imagine storing every human who ever lived, beyond the reach of the Qax and other predators.'

'But how would you store the data? We know already that a black hole is a vast source of entropy; if an object of whatever complexity implodes into a hole, all bits of data about it are lost to the outside universe save its charge, mass and spin—'

'Singularities themselves are complex objects,' Shira said. 'Unimaginably so. Our understanding of them has advanced enormously since your time. It may be possible to store data in the structure of the spacetime flaw itself—'

'But,' Parz said, his round, weak face broken by a sly smile, 'with respect, my dear, you still haven't told us precisely what your message to these superbeings of the future would be. Even if you succeeded in transmitting it.'

Michael settled back on his couch. 'Why, that much is obvious,' he said.

Shira watched him, utterly erect and tense. 'Is it?'

'You're trying to get a message to the Ultimate Observer.' He heard Parz call out wordlessly, but he pressed on. 'You want to influence the way the Observer selects the optimal lifeline of the cosmos; you want to ensure that data about humanity reaches the post-Qax future, and that the Observer selects worldlines in favour of humanity.' Michael smiled. 'I'm right, aren't I? I have to admire your capacity for thinking big, Shira.'

Shira nodded, stiffly. 'Our goal is a valid one, from a racial point of view.'

He inclined his head in return. 'Oh, certainly. None more valid. And once the final Observation takes place, the events we have endured will not have taken place, and the means you have employed are justified ... because if the end is met, *the means won't even have occurred*.'

‘It’s utterly outrageous,’ Parz said, green eyes sparkling. ‘But wonderful! I love it.’

Shira sat silently, her eyes still locked disconcertingly on Michael’s.

‘Well, at least we know what’s going on now,’ Harry said brightly. ‘But now comes the difficult bit. Do we help them ... or try to stop them?’

The dot of blue light at the zenith had grown to the size of a fist.

Shira shrugged, almost casually. ‘I have no more influence to exert on you. I can only rely on your wisdom.’

‘Right.’ Michael pursed his lips. ‘But you weren’t so keen on trusting to that wisdom earlier, were you?’

‘We did not believe you would understand,’ she said simply. ‘We calculated it was more likely to yield success if we proceeded alone.’

‘Yes,’ said Parz coldly. ‘Perhaps you were wise to attempt such a course, my dear. I have learned that these people, from fifteen centuries before our shared era, are behind us in knowledge and some experiences, but are our peers - more than our peers - in wisdom. I suspect you knew what the reaction of these people would be to your schemes; you knew they would oppose you.’

Shira looked at Michael uncertainly.

He said, somewhat reluctantly, unwilling to be cruel to this young, earnest girl, ‘He’s talking about hubris, Shira. Arrogance.’

‘We are attempting to avert the extinction of the species,’ Shira said, her voice fragile.

‘Maybe. Shira, to my dying day I will honour the courage, the ingenuity of the Friends. To have constructed the earth-craft under the very eyes of the Qax; to have hurled yourselves unhesitatingly into an unknown past ... Yes, you have courage and vision. But - *what right do you have to tinker with the history of the universe?* What gives *you* the wisdom to do that, Shira - regardless of the validity of your motives? Listen, you scared us all to death when we thought you were just trying to create a naked singularity. That would have set off an unpredictable explosion of acausality. But in fact you’re trying to disrupt causality deliberately - and on the largest scale.’

‘You dare not oppose us,’ Shira said. Her face was a mask of anger, of almost childish resentment.

Michael closed his eyes. ‘I don’t think I dare allow you to go ahead. Look, Shira, maybe the whole logic of your argument is flawed. For a start,

the philosophical basis for the whole thing - that particular resolution of the Wigner paradox - is speculative, just one among many.'

Parz nodded. 'And where is the evidence of this advance of life that you've based your hopes on? The most advanced species we know are the Xeelee. But the Xeelee don't fit the description, give no evidence of sharing the goals you've advanced. They show no signs of having the gathering and recording of data as their key racial motive. Indeed their goal seems to be very different - the construction of their Kerr-metric gateway to another universe - and they seem prepared to destroy data, in the form of structures on an intergalactic scale, to do it. So how will this cosmic eye, this Ultimate Observer of yours, ever come about, if even the Xeelee don't want to lead us towards its formation?'

Her nostrils flared. 'You're not going to help us. You're going to try to stop us. Michael Poole, you are—'

Poole held his hands up. 'Look, don't bother insulting me again. I'm sure I'm a fool, but I'm a fool who doesn't trust himself where a final solution to the history of the universe is concerned. I'd do anything to avert the imposition of such a solution, I think.'

'Perhaps the Project won't, or can't, succeed,' Shira said. 'But it remains humanity's best and only hope of removing the Qax yoke.'

'No,' he said. He smiled, an immense sadness sweeping over him; he felt irrationally ashamed at his systematic demolition of this young person's ideals. 'That's the clinching argument, I'm afraid, Shira. The fact is, we don't need your Project.' He nodded to Parz. 'Jasoft has told us. Humans will get out from under the oppression of the Qax. It will take a long time, and will mean the near destruction of the Qax - but it will be done, we know that now, and it will come from the simple, surprising, actions of a single man. From the unpredictability of humanity.' He studied her empty face, the surface of an incomplete personality, he realized now. 'Ordinary humanity will beat the Qax in the end, Shira. But that's beyond your imagining, isn't it? We won't need your grandiose schemes to win freedom by sabotaging history.'

'But—'

'And the only way that outcome can be subverted, as far as I can see,' Michael pressed on, 'is if we leave that portal open; if we allow the Qax themselves more chances to change history - in their favour. I'm sorry I had

anything to do with building the damn thing, unleashing all this trouble in the first place. Now, all I want to do is to put that right ...'

'You'll be killed,' Shira said, clutching at straws.

He laughed. 'Funnily enough, that doesn't seem to matter so much any more ... But I don't want to take you all with me, if I don't have to. Harry, give me an option to get them off before we hit.'

'Working,' Harry said calmly. 'Thirteen minutes to the portal, now.'

Parz seemed to squirm, uncomfortable, in his chair. 'I'm not certain I deserve such a reprieve,' he said.

'Then think of it as an assignment,' Michael said briskly. 'I need you to get this girl off the ship. Do you think she's going to go voluntarily?'

Parz studied Shira briefly, as she continued to stand before Michael, clenching and unclenching her small fists. 'Perhaps not,' he said sadly.

'Twelve minutes,' Harry said.

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14

From a scarred, bruised socket in the elephant-grey hide of the Spline, a three-yard-wide eyeball popped into space, trailing a length of thick optic nerve. Antibody drones, squabbling and scrambling over each other, swarmed over the translucent surface of the eyeball and along the length of the nerve trunk. Red laser light sparked from the mouths of a dozen of the drones, sawing at the trunk; at last the trunk parted, with fully a yard of its length disintegrating into laser-sliced fragments. The warship surged up towards the blue mouth of the Interface portal; drones, scrabbling to hang on, slid away from the abandoned eyeball and from the severed trunk, still spitting at each other with tiny, fierce bolts of laser light.

As the Spline receded to a knot of bruised flesh, Jasoft Parz turned and surveyed the interior of the eye chamber. His only companion, the Wigner Friend girl Shira, floated somewhere near the eyeball's geometric centre, her thin body curled into a loose foetal position, her eyes half-closed. Studying her, Parz felt suddenly vulnerable in this chamber, dressed as he was only in this ill-fitting, rather worn gown of Michael Poole's. The entoptic fluid had been drained, the eyeball hurriedly pumped full of air to accommodate the two of them; and he had forgone his skinsuit, in order to share the dangers Shira would have to face.

He shivered with a sudden chill of fear, feeling naked.

He sought something to say.

'You must not fear the future, my dear. Michael Poole has done his best to preserve us from the fate he has decreed for himself. We have air in this chamber sufficient for many hours, and Poole has given us heating elements, a packet of water and food. We should survive long enough to be picked up by the craft of this era. And I've every reason to believe you'll soon be reunited with your own people, on the earth-craft.'

Now she swivelled her head to face him; her watery-blue eyes seemed bruised, as if from weeping. 'Cold comfort coming from a servant of the Qax, Jasoft Parz.'

He tried not to flinch. 'I can't blame you for that,' he said patiently. 'But such labels are behind us now, Shira. We are here, you and I, in this ancient time frame; and here, after the destruction of the Interface, we will spend the rest of our lives. You must begin to accept that, and think forward—'

‘I accept I am trapped,’ she said. ‘I accept little else.’

‘Trapped in the past? You shouldn’t think of it like that. We have been brought to a new era - in many ways a better era, a golden age in man’s history. Think of it, Shira; the humans of this era are looking outwards, only beginning to explore the potentialities of the universe in which they are embedded, and the resources of their own being. They have banished many of the ills, social as well as physiological - hunger, disease, untimely death, which, thanks to the Qax, our lost contemporaries endure. There are many projects here for you to—’

‘You don’t understand,’ she snapped. ‘I do not mean trapped merely in the past. I mean trapped in the *future*. Thanks to the destruction of the Project by the insane arrogance of Michael Poole, I am trapped in this single, doomed timeline.’

‘Ah. Your vision of globally optimized event chains—’

‘Don’t speak to me of visions, collaborator.’ Her words were delivered in an even, matter-of-fact tone, and were the more stinging for that. ‘What visions have sustained you?’

He felt the muscles of his cheeks twitch. ‘Look, Shira, I’m trying to help you. If you want to insult me, then that’s fine. But sooner or later you’re going to have to accept the fact that, like me, you’re trapped here. In the past.’

She turned her head away again, quite gracefully, and bowed it towards her knees; her body rocked a little in the air. ‘No,’ she said.

He began to feel irritated. ‘What do you mean, “no”? Once the damn Interface is closed down you’ll have no way back to the future.’

Now, unexpectedly, she smiled. ‘No short cut. No, I accept that. But there is another way back. The longer way.’

He frowned.

She went on, ‘I mean to accept AntiSenescence treatment here. If I’m offered it, or can buy it. And then—’

‘—And then it’s a simple matter of living through fifteen centuries - *fifty generations* - waiting for the reemergence of singularity technology. So you can start all over again. Is that what you mean?’

Her smile lingered.

‘How can you think in such terms?’ he demanded. ‘You got to know Michael Poole; after two centuries of life his head was so full of detritus, of

layers of experience, that at times he could barely function. You saw that, didn't you? Why do you think he spent decades, literally, alone in that GUTship in the cometary halo? And you're talking, almost casually, about lasting more than seven times as long. How can any purpose endure through such an immense timescale? It's - beyond the human ...'

The girl did not reply, but her smile lingered on, inwardly directed; and Parz, despite his superiority in years to this girl, felt as if he had become something weak and transient, a mayfly, beside the immense, burning purpose of Shira.

Harry crystallized onto the empty couch beside Michael. The image was weak and wavering, the pixels crowding and of uneven size - evidently Harry didn't have available the processing power he'd used earlier - but there was at least an illusion of solidity, of another presence in the lifedome, and Michael felt grateful enough for that.

Michael lay back on his couch, trying to achieve a state of inner, and outer, relaxation, but he was betrayed by knots of tension in his forehead, his neck, his upper back. He watched the Interface portal blossom open above his head. It spanned most of the dome now. The Spline warship, with the *Crab* embedded within, was moving along a trajectory which passed the cheek of Jupiter tangentially, and from Michael's position the portal now hung against a backdrop of velvet space, of distant, inhabited stars. The portal's clean blue-violet geometry - and the burnished-gold effect of the glimmering faces of the tetrahedron, the shadowy reflections of other times and places - were really quite beautiful.

Harry said, his voice scratchy, 'I suppose you do know what you're doing?'

Michael couldn't help but laugh. 'It's a bit late to ask that now.'

Harry cleared his throat. 'I mean, this whole caper has been improvised: I just wondered if you had any clearer ideas about your precise intentions when, say, you were ramming a lump of comet-ice down the throat of a Spline warship from the future.'

'Well, it worked, didn't it?'

'Yeah, through sheer luck. Only because the Spline was bemused by causality stress, and poor old Jasoft started setting fire to the Spline's nervous system.'

Michael smiled. ‘It wasn’t luck. Not really. What beat the Qax in the end was their own damned complacency. Jasoft was a loophole, a weakness, which they brought back through time with them. If it hadn’t been for Jasoft Parz they would have left some other hole, another Achilles’ heel for us to exploit. They were so certain they could scrape us out of the Solar System without any trouble, so certain there was nothing we could do to resist them —’

‘All right, all right.’ Harry threw up his ghostly hands. ‘Come on, Michael. How are we going to destroy the wormhole?’

‘I don’t know for sure.’

‘Oh, terrific.’ Harry’s face turned fuzzy for a moment and Michael imagined that more processing power was being diverted from the image. Now it downgraded further, until the illusion of a solid presence in the chair beside Michael was almost lost.

‘Harry, is there some problem? I thought we were on routine running until we hit the Interface.’

Harry’s voice came to him through a sea of phasing and static. ‘It’s these drones,’ he said. ‘They’re just too damn smart.’

‘I thought you had them under control. You organized them to cast off the eye chamber with Shira and Parz, to cut the nerve trunk—’

‘Yeah, but I’m not experienced at handling them. Remember, they’re not simple remotes; they have a lot of processing power of their own. It’s like - I don’t know - like trying to get work done by a few thousand strong-willed ten-year-olds. Michael, one bunch of them has gone ape. They’ve formed into a raiding party; they’re working through the carcass in search of the high-density power sources. They’re being resisted by others because the damage they’re doing is going to be detrimental to the functioning of the Spline in the long run. But the resistance isn’t organized yet ... and any drone which opposes them is chewed up by those damn little laser jaws of theirs.’

Michael laughed. ‘What’s going to be the outcome?’

‘I don’t know ... The raiders are heading for the heart of the Spline, now. And I mean the heart, literally; a city-block of power-cells and muscle stumps centred around the hyperdrive unit. The area of greatest energy density. If the raiders get through there’ll be hell to pay; the rest of the ship’s systems will be too drained of power to be able to do anything about

it, and ultimately they'll decommission the hyperdrive ... But it might not get that far. Other drones are forming up to oppose them. It looks as if there's going to be a pitched battle, soon, somewhere in the region of the heart. But at the moment my money is on the rogue, rebel drones; the defenders just haven't got the leadership—'

Michael cut in, 'Oh, for God's sake, Harry, will you shut up about the drones? Who cares about the damn drones, at a time like this?'

Harry frowned, blurredly. 'Look, Michael, this isn't a joke. These rebels could disable the hyperdrive, out from under us. And you want to use the hyperdrive in your scheme to wreck the Interface, don't you?'

'What's the timescale for all this?'

Harry turned away, flickering. 'Twenty minutes for the battle to resolve itself. Another ten for the rebels, assuming they win, to cut their way into the heart and get to the hyperdrive and other power sources. Let's say thirty, total, at the outside, before we lose hyperdrive functionality.'

Michael pointed up at the Interface. 'And how long before we're in the guts of that thing?'

Harry thought for a few seconds. 'Six minutes, tops.'

'Okay, then. That's why you should forget about the damn drones. By the time they've done their worst it will all be over, one way or the other.'

Harry pulled a face. 'All right, point taken. But it doesn't get you out of explaining to me how you're going to blow up the Interface portal.' Harry turned his head up to the blue-glowing portal, and - with an evident surge of processing concentration - he produced blue-violet highlights on his Virtual cheekbones. 'I mean, if we simply ram that portal, the corpse of this damn ship is going to be cut up like ripe cheese, isn't it?'

'Right. I doubt if you could do much harm to a structure of exotic matter by smashing it with a lump of conventional material; the density difference would make it as absurd as trying to knock down a building by blowing it a kiss ... We're going to enter the Interface as best we can in this tub—'

'And then what?'

'Harry, do you understand how the hyperdrive works?'

Harry grinned. 'Yes and no.'

'What's that supposed to mean?'

‘It means that I’ve now merged with the residuum of the Spline’s consciousness. And the operation of the hyperdrive is buried in there somewhere ... But it’s like working the muscles that let you stand up and walk about. Do you understand me?’ He looked at Michael, almost wistfully, his face more boyish than ever. ‘The Spline core of me knows all about the hyperdrive. But the human shell of Harry, what’s left of it, knows damn-all. And - I find I’m scared, Michael.’

Michael found himself frowning, disturbed by Harry’s tone. ‘You sound pathetic, Harry.’

‘Well, I’m sorry you don’t approve,’ Harry said defiantly. ‘But it’s honest. I’m still human, son.’

Michael shook his head, impatient with the sudden jumble of emotions he found stirring inside him. ‘The hyperdrive,’ he said sternly. ‘All right, Harry. How many dimensions does spacetime have?’

Harry opened his mouth, closed it again. ‘Four. Three space, one time. Doesn’t it? All wrapped up into some kind of four-dimensional sphere ...’

‘Wrong. Sorry, Harry. There are actually *eleven*. And the extra seven is what allows the hyperdrive to work ...’

The grand unified theories of physics - the frameworks which merged gravitation and quantum mechanics - predicted that spacetime ought to assume a full eleven dimensions. The logic, the symmetry of the ideas would allow little else.

And eleven dimensions there turned out to be.

But human senses could perceive only four of those dimensions, directly. The others existed, but on a tiny scale. The seven compactified dimensions were rolled into the topological equivalent of tight tubes, with diameters well within the Planck length, the quantum limit to measurement of size.

‘Well, so what? Can we observe these compactifed tubes?’

‘Not directly. But, Harry, looked at another way, the tubes determine the values of the fundamental physical constants of the universe. The gravitational constant, the charge on the electron, Planck’s constant, the uncertainty scale ...’

Harry nodded. ‘And if one of these tubes of compactification were opened up a little—’

‘—the constants would change. Or,’ said Michael significantly, ‘vice versa.’

‘You’re getting to how the hyperdrive works.’

‘Yes ... As far as I can make out, the hyperdrive suppresses, locally, one of the constants of physics. Or, more likely, a dimensionless combination of them.’

‘And by suppressing those constants—’

‘—you can relax the compactification of the extra dimensions, locally, at least. And by allowing the ship to move a short distance in a fifth spacetime-dimension, you can allow it to traverse great distances in the conventional dimensions.’

Harry held up his hands. ‘Enough. I understand how the hyperdrive works. Now tell me what it all means.’

Michael turned to him and grinned. ‘Okay, here’s the plan. We enter the Interface, travel into the wormhole—’

Harry winced. ‘Let me guess. And then we start up the hyperdrive.’

Michael nodded.

The Interface portal was immense over them, now. One glimmering pool of a facet filled Michael’s vision, so close that he could no longer make out the electric blue struts of exotic matter which bounded it.

‘Three minutes away,’ Harry said quietly.

‘Okay.’ As an afterthought Michael added: ‘Thanks, Harry.’

‘Michael - I know this won’t, and mustn’t, make a damn bit of difference - but I don’t think there’s any way I can survive this. I can’t function independently of the Spline any more; I’ve interwoven the AI functionalities of Spline and *Crab* so much that if one fails, so must the other ...’

Michael found himself reaching out to the Virtual of his father; embarrassed, he drew his hand back. ‘No. I know. I’m sorry, I guess. If it’s any consolation I’m not going to live through it either.’

Harry’s young face broke up into a swarm of pixels. ‘That’s no consolation at all, damn you,’ he whispered distantly.

The Interface was very close now; Michael caught reflections of the Spline in that great, glimmering face, as if the facet were some immense pool into which the warship was about to plunge.

Harry crumbled into pixel dust, reformed again, edgily. ‘Damn those drones,’ he grumbled. ‘Look, Michael, while there’s enough time there’s something I have to tell you ...’

The intrasystem freighter settled over the battered, gouged-out Spline eyeball. Cargo-bay doors hung open like welcoming lips, revealing a brightly lit hold.

The eye bumped against the hold’s flat ceiling, rebounding softly; a few yards of chewed-up optic nerve followed it like a grizzled remnant of umbilical cord, wrapping itself slowly around the turning eye. Then the hold doors slid shut, and the eye was swallowed.

In an airlock outside the hold, Miriam Berg pressed her face to a thick inspection window. She cradled a heavy-duty industrial-strength hand-laser, and her fingers rattled against the laser’s casing as the hold’s pressure equalized.

She cast her gaze around the scuffed walls of the hold with some distaste. This was the *Narlikar* out of Ganymede, an inter-moon freighter run by a tinpot two-man shipping line. She knew she shouldn’t expect too much of a ship like this. The D’Arcy brothers performed a dirty, dangerous job. Normally this hold would contain water ice from Ganymede or Europa, or exotic sulphur compounds excavated with extreme peril from the stinking surface of Io. So that would explain some of the stains. But sulphur compounds didn’t scratch tasteless graffiti onto the hold walls, she thought. Nor did they leave sticky patches and half-eaten meals all over - it seemed - every work surface. Still, she was lucky there had been even one ship in the area capable of coming to pick up this damn eyeball so quickly. Most of the ships in the vicinity of the Interface portal were clean-lined government or military boats - but it had been the D’Arcy brothers, in their battered old tub, who had come shouldering through the crowd to pick her up from the earth-craft in answer to the frantic, all-channel request she’d put out when she’d realized what Poole was up to.

She watched the Spline eyeball bounce around in the hold’s thickening air. It was like some absurd beachball, she thought sourly, plastered with dried blood and the stumps of severed muscles. But there was a clear area - the lens? - through which human figures, tantalizingly obscure, could be seen.

Michael . . .

Now a synthesized bell chimed softly, and the door separating her from the hold fell open. Towing the laser, Berg threw herself into the eyeball-filled hold.

The air in the hold was fresh, if damn cold through the flimsy, begrimed Wignerian one-piece coverall she'd been wearing since before the Qax attack. She took a draught of atmosphere into her lungs, checking the pressure and tasting the air—

'Jesus.'

—and she almost gagged at the mélange of odours which filled her head. Maybe she should have anticipated this. The gouged-out Spline eyeball *stank* like three-week-old meat - there was a smell of burning, of scorched flesh, and subtler stenches, perhaps arising from the half-frozen, viscous purple gunk which seemed to be seeping from the severed nerve trunk. And underlying it all, of course, thanks to her hosts the D'Arcys, was the nose-burning tang of sulphur.

Every time the eyeball hit the walls of the hold, it squelched softly.

She shook her head, feeling her throat spasm at the stench. Spline ships; what a way to travel.

After one or two more bounces, air resistance slowed the motion of the sphere. The eyeball settled, quivering gently, in the air at the centre of the hold.

Beyond the Spline's clouded lens she could see movement; it was like looking into a murky fishtank. There was somebody in there, peering out at her.

It was time.

Her mind seemed to race; her mouth dried. She tried to put it all out of her head and concentrate on the task in hand. She raised her laser.

The D'Arcys, after picking her up from the earth-craft, had loaned her this hand-laser, a huge, inertia-laden thing designed for slicing ton masses of ore from Valhalla Crater, Callisto. It took both hands and the strength of all her muscles to set the thing swinging through the air to point its snout-like muzzle at the Spline eyeball, and all her strength again to slow its rotation, to steady it and aim. She wanted to set the thing hanging in the air so that - with any luck - she'd slice tangentially at the eyeball, cutting away the lens area without the beam lancing too far into the inhabited interior of the eyeball. Once the laser was aimed, she swam over and, pressing her face

as close to the clouding lens as she could bear, she peered into the interior. There were two people in there, reduced to little more than stick-figures by the opacity of the dead lens material. With her open palm she slapped at the surface of the lens - and her hand broke through a crust-like surface and sank into a thick, mouldering mess; she yanked her hand away, shaking it to clear it of clinging scraps of meat. ‘Get away from the lens!’ She shouted and mouthed the words with exaggerated movements of her lips, and she waved her hands in brushing motions.

The two unidentifiable passengers got the message; they moved further away from the lens, back into the revolting shadows.

Taking care not to touch the fleshy parts again, Berg moved away and back to her laser. She palmed the controls, setting the dispersion range for five yards. A blue-purple line of light, geometrically perfect, leapt into existence, almost grazing the cloudy lens; Berg checked that the coherence was sufficiently low that the beam did no more than cast a thumb-sized spot of light on the hold’s far bulkhead.

Shoving gently at the laser, she sliced the beam down. As the opaque lens material burned and shrivelled away from laser fire, brownish air puffed out of the eyeball, dispersing rapidly into the hold’s atmosphere; and still another aroma was added to the mélange in Berg’s head - this one, oddly, not too unpleasant, a little like fresh leather.

A disc of lens material fell away, as neat as a hatchway. Droplets of some fluid leaked into the air from the rim of the removed lens, connecting the detached disc by sticky, weblike threads.

She still couldn’t see into the meaty sphere; and there was silence from the chamber she had opened up.

Berg thumbed the laser to stillness. Absently she reached for the detached lens-stuff and pulled it from the improvised hatchway; the loops of entoptic material stretched and broke, and she sent the disc spinning away.

Then, unable to think of anything else to do, and quite unable to go into the opening she’d made, she hovered in the air, staring at the surgically clean, leaking lip of the aperture.

Thin hands emerged, grasped the lip uncertainly. The small, sleek head of Jasoft Parz emerged into the air of the *Narlikar*. He saw Berg, nodded with an odd, stiff courtesy, and - with an ungainly grace - swept his legs, bent at the knees, out of the aperture. He shivered slightly in the fresh air

outside the eyeball; he was barefoot, and dressed in a battered, begrimed dressing gown - one of Michael's, Berg realized. Parz seemed to be trying to smile at her. He hovered in the air, clinging to the aperture of the eye with one hand like an ungainly spider. He said, 'This is the second time I've been extracted from a Spline eyeball, after expecting only death. Thank you, Miriam; it's nice to meet you in the flesh.'

Berg was quite unable to reply.

Now a second figure emerged slowly from the eye. This was the Wigner girl Shira, dressed - like Berg - in the grubby remnants of a Wigner coverall. The girl perched on the lip of the aperture, her legs tucked under her, and briefly scanned the interior of the freighter's hold, her face blank. She faced Berg. 'Miriam. I didn't expect to see you again.'

'No.' Berg forced the words out. 'I ...'

There was something like compassion in Shira's eyes - the closest approximation to human warmth Miriam had ever seen in that cold, skull-like visage - and Berg hated her for it. The Friend said, 'There's nobody else, Miriam. There's only the two of us. I'm sorry.'

Berg wanted to deny what she said, to shove past these battered, stained strangers and hurl herself headfirst into the eyeball, search it for herself. Instead she kept her face still and dug her nails into her palm; soon she felt a trickle of blood on her wrist.

Parz smiled at her, his green eyes soft. 'Miriam. They - Michael and Harry - have contrived a scheme. They are going to use the wreckage of the Spline to close the wormhole Interface, to remove the risk of any more incursions from the Qax occupation future. Or any other future, for that matter.'

'And they've stayed aboard. Both of them.'

Parz's face was almost comically solemn. 'Yes. Michael is very brave, Miriam. I think you should take comfort from—'

'Bollix to that, you pompous old fart.' Berg turned to Shira. 'Why the hell didn't he at least speak to me? He turned his comms to slag, didn't he? Why? Do you know?'

Shira shrugged, a trace of residual, human concern still evident over her basic indifference. 'Because of his fear.'

'Parz calls him brave. You call him a coward. What's he afraid of?'

Shira's mouth twitched. 'Perhaps you, a little. But mostly himself.'

Parz nodded his head. ‘I think she’s right, Miriam. I don’t think Michael was certain he could maintain his resolve if he spoke to you.’

Berg felt anger, frustration, surge through her. Of course she’d known people die before; and her lingering memories of those times had always been filled with an immense frustration at unfinished business - personal or otherwise. There was always so much left to say that could now never be said. In a way this was worse, she realized; the bastard wasn’t even dead yet but he was already as inaccessible as if he were in the grave. ‘That’s damn cold comfort.’

‘But,’ Jasoft Parz said gently, ‘it’s all we can offer.’

‘Yeah.’ She shook her head, trying to restore some sense of purpose. ‘Well, we may as well go and watch the fireworks. Come on. Then let’s see if these tinpot freighters run to shower cubicles ...’

The freighter’s bridge was cramped, stuffy, every flat surface coated with notes scrawled on adhesive bits of paper. Only the regal light of Jupiter, flooding into the squalid space through a clear-view port, gave the place any semblance of dignity. The D’Arcy brothers, fat, moon-faced and disconcertingly alike, watched from their control couches as Berg led her bizarre party onto their bridge. Berg said gruffly, ‘Jasoft. Shira. Meet your great-grandparents.’

Then, leaving the four of them staring cautiously at each other, Miriam turned her face to the clear-view port, lifted her face to the zenith. Against the cheek of Jupiter the frame of the Interface portal was a tetrahedral stencil; and the Spline warship, the lodged wreckage of the *Crab* clearly visible even at this distance, was like a bunched fist against the portal’s geometric elegance.

As she watched, the warship entered the Interface; blood-coloured sparks ringing the Spline where the battered carcass brushed the exotic-matter frame of the portal.

Berg considered raising a hand in farewell.

The sparks flared until the Spline was lost to view.

Miriam closed her eyes.

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15

The lifedome of the *Crab* was swallowed by the encroaching darkness of the Interface portal. Michael, staring up through the dome, found himself cowering.

Blue-violet fire flared from the lip of the lifedome; it was like multiple dawns arising from all around Michael's limited horizon. Harry, from the couch beside Michael's, looked across fearfully. Michael said, 'That's the hull of the Spline hitting the exotic-matter framework. I'd guess it's doing a lot of damage. Harry, are you—'

The holographic Virtual of Harry Poole opened its mouth wide - impossibly wide - and screamed; the sound was an inhuman chirp that slid upwards through the frequency scales and folded out of Michael's sensorium.

The Virtual smashed into a hail of pixels and crumbled, sparkling.

The Spline shuddered as it entered the spacetime wormhole itself; Michael, helplessly gripping the straps which bound him to his couch, found it impossible to forget that the vessel which was carrying him into the future was no product of technology, but had once been a fragile, sentient, living thing.

Harry's head popped back into existence just above Michael's face. Harry looked freshly scrubbed, his hair neatly combed. 'Sorry about that,' he said sheepishly. 'I should have anticipated the shock as we hit the exotic matter. I think I'll be okay now; I've shut down a lot of the nerve/sensor trunks connecting the central processor to the rest of the ship. Of course I've lost a lot of functionality.'

A vast sense of loss, of alienation, swept over Michael; Harry's face was an incongruously cheerful blob of animation in a vision field otherwise filled with the emptiness of a spacetime flaw. He forced himself to reply. 'I - hardly think it matters any more. As long as we can power up the hyperdrive.'

'Sure. And I've my battalions of loyal antibody drones protecting the remaining key areas of the ship; they ought to be able to hold out until it doesn't matter one way or the other.' The Virtual head plummeted disconcertingly towards Michael until it hovered a mere foot above his

nose; it peered down at him with exaggerated concern. ‘Are you okay, Michael?’

Michael tried to grin, to come back with a sharp reply, but the feeling of desolation was like a black, widening pool inside his head. ‘No,’ he said. ‘No, I’m not damn well okay.’

Harry nodded, looking sage, and receded into the air. ‘You have to understand what’s happening to you, Michael. We’re passing from one time frame to another. Remember how Jasoft Parz described this experience? The quantum functions linking you to your world - the nonlocal connections between you and everything and everybody you touched, heard, saw - are being stretched thin, broken ... You’re being left as isolated as if you’d only just been born.’

‘Yes.’ Michael gritted his teeth, trying to suppress a sensation of huge, psychic pain. ‘Yes, I understand all of that. But it doesn’t help. And it doesn’t help, either, that I’ve just left behind Miriam, everyone and everything I know, without so much as a farewell. And it doesn’t help that I face nothing but death; and that only the level of pain remains to be determined ... I’m scared, Harry.’

Harry opened his mouth to speak, closed it again; convincing-looking tears brimmed in his eyes.

An unreasonable anger flared in Michael. ‘Don’t you get sentimental on me again, you damn - facsimile.’

Harry’s grin was slight. ‘Should we activate the hyperdrive?’ he asked softly. ‘Get this affair over and done with?’

Michael closed his eyes and shook his head, his neck muscles stiff and tight, almost rigid. ‘Not yet. Wait until we’re well inside the throat of the wormhole.’

Harry hesitated. ‘Michael, what exactly will the hyperdrive operation do to the wormhole?’

‘I don’t know for sure,’ Michael said. ‘How can I know for sure? No one’s tried such a damn fool experiment before. Look, a wormhole is a flaw in space-time, kept open by threads of exotic matter. And it’s an unstable flaw.

‘When the hyperdrive operates, the dimensionality of spacetime is changed, locally. And if we do that inside the wormhole itself - deep inside, near the midpoint, where the stress on the flawed spacetime will be highest

- I don’t see how the wormhole feedback control systems can maintain stability.’

‘And then what?’

Michael shrugged. ‘I’ve no idea. But I’m damn sure the Interface will no longer be passable. And I’m hoping that the collapse we initiate will go further, Harry. Remember that more wormhole links have been set up, to the future beyond Jim Bolder and his heroics. I don’t want to leave the opportunity for more Qax of that era to come back and try wrecking history again.’

‘Can we close the other wormholes?’

Poole shrugged. ‘Maybe. Wormholes put spacetime under a lot of stress, Harry ...’

‘ ... And us?’ Harry asked gently.

Michael met the Virtual’s gaze. ‘What do you think? Look, I’m sorry, Harry.’ He frowned. ‘Well, what were you going to tell me?’

‘When?’

‘Your big secret. Just before we hit the exotic matter.’

Harry’s head shrank a little in an odd, shy gesture. ‘Ah. I was vaguely hoping you’d forgotten that.’

Michael clicked his tongue, exasperated. ‘My God, Harry, we’ve just minutes to live and you’re still a pain in the arse.’

‘I’m dead.’

‘... What?’

‘I’m dead. The real Harry Poole, that is. The original.’ Harry’s eyes held Michael’s and his tone was level, matter-of-fact. ‘I’ve been dead thirty years, now, Michael. More, in fact.’

Michael, lost in quantum isolation, tried to make sense of this ghostly news. ‘How did you - he—’

‘I reacted adversely to a stage of the AS treatment. Couldn’t accept it; my body couldn’t take any more. One in a thousand react like that, they tell me. I lived a few more years. I aged rapidly. I, ah - I stored this Virtual as soon as I understood what was going to happen. I didn’t have any specific purpose in mind for it. I didn’t plan to transmit it to you. I just thought, maybe, it might be of use to you one day. A comfort, even.’

Michael frowned. ‘I don’t know what to say. I’m sorry. I ... know how much your youth, your—’

‘My good looks, health and potency.’ Harry grinned. ‘Don’t be afraid to say it, Michael; I’m kind of beyond modesty. All the things I wanted to keep, which irritated you so much.’

‘I know how much life meant to you.’

Harry nodded. ‘Thank you. I’m thanking you for him. He - Harry - died before I, the Virtual, was animated. I share his memories up to the point where he took the Virtual copy; then there’s a gap. Before the end of his life he left me a message, though.’

Michael shook his head. ‘He left one of his own Virtuals a message. Well, that’s my father.’

‘Michael, he said he didn’t fear death.’ Harry looked thoughtful. ‘He’d changed, Michael. Changed from the person I was, or am. I think he wanted me to tell you that, in case you ever encountered me. Perhaps he thought it would be a comfort.’

The Spline shuddered again, more violently now, and Michael, staring beyond the dome, seemed to see detail in what had previously been formlessness. Blue-white light, sparking from tortured hull-flesh, continued to flare at the edge of his vision. Fragments of light swam from a vanishing point directly above his head down the spacetime walls and, fading, shot down over his horizon. They were flashes, sheets of colourless light; it was like watching lightning behind clouds. This was radiation generated, he knew, by the unravelling of stressed spacetime, here deep in the throat of the flaw. He gripped the couch. For the first time he had a genuine sensation of speed, of limitless, uncontrollable velocity. The lifedome was a fragile, vulnerable thing above him, no more protection than a canvas tent as he plummeted through this spacetime flaw; and he tried not to cower, to hide his head from the sky which stretched over him.

‘Why didn’t he tell me?’

Harry’s expression hardened. ‘He didn’t know how to tell you. He was genuinely concerned about causing you pain - I hope you believe that. But the basic reason was that the two of you haven’t shared a moment of closeness, of - of *intimacy* - since you were ten years old. That’s why.’ He glared down at Michael. ‘What did you expect? He turned to his friends, Michael.’

‘I’m sorry.’

‘So am I,’ said Harry earnestly. ‘So was he. But that was the way it was.’

‘That’s the trouble with living so damned long,’ Michael said. ‘Soured relationships last for ever.’ He shook his head. ‘But still ... I’d never even have heard about it if you hadn’t been transmitted to persuade me to come in from the Oort Cloud.’

‘They - the multi-government committee set up to handle this incident - thought I’d have a better chance of persuading you if you didn’t know; if I didn’t tell you about the death.’

Michael almost smiled. ‘Why the hell did they think that?’

‘What do multi-government committees know about the relationship between father and son?’

The walls of the wormhole seemed to be constricting like a throat. Still the lightning-like splashes of light shone through the walls. ‘I think it’s time,’ Michael said. ‘You’ll handle the hyperdrive?’

‘Sure. I guess you don’t need a countdown ... Michael. You have a message.’

‘What are you talking about? Who the hell can be contacting me now?’

Harry, his face straight, said, ‘It’s a representative of the rebel antibody drones. They’re not unintelligent, Michael; somehow they’ve patched in to a translator circuit. They want me to let them talk to you.’

‘What do they want?’

‘They’ve ringed the hyperdrive. The drones consider it - ah, a hostage.’

‘And?’

‘They’re willing to sue for peace. In the spirit of interspecies harmony. They have a long list of conditions, though.’ Harry frowned down at Michael. ‘Do you want to hear what they are? First—’

‘No. Just tell me this. Do you still control the hyperdrive?’

‘Yes.’

Michael felt the tension drain out of his neck muscles, it seemed for the first time in days; a sensation of peace swept over him. He laughed. ‘Tell them where they can stick their list.’

Harry’s head ballooned. He smiled, young and confident. ‘I think it’s time. Goodbye, Michael.’

The hyperdrive engaged. The Spline warship convulsed.

Ribbons of blue-white light poured through the cracking walls of spacetime; Michael could almost feel the photons as they sleeted through the absurd fragility of the lifedome.

A lost corner of Michael's consciousness continued to analyse, even to wonder. He was seeing unbearable shear stresses in twisted spacetime resolving themselves into radiant energy as the wormhole failed. At any moment now the residual shielding of the lifedome would surely collapse; already the flesh of the Spline corpse must be boiling away. Knowing what was happening didn't really help, of course - something which, Michael thought, it was a bit late to discover.

Harry's Virtual imploded, finally, under the pressure of the godlike glare beyond the dome.

Bits of the wormhole seemed literally to fall away before the *Crab*. Cracks in spacetime opened up like branching tunnels, stretching to infinity.

Michael wasn't sure if that should be happening. Maybe this wouldn't go quite according to plan ...

Spacetime was shattering. Michael screamed and pressed his fists to his eyes.

On the earth-craft, the image of the Interface portal glittered on every data slate.

Miriam Berg sat on scorched grass, close enough to the centre of the earth-craft to see, beyond the ruined construction-material homes of the Friends of Wigner, the brownish sandstone shards that marked the site of the ancient henge.

Jasoft Parz, clothed in a fresh but ill-fitting Wignerian coverall, sat close to her, his short legs stretched out on the grass. The *Narlikar*'s only boat stood on blackened earth close by her. The D'Arcys had brought her back here, after her retrieval of Shira and Jasoft Parz.

She was aware that Parz's green eyes were fixed on her. That he was almost radiating sympathy.

Well, damn him. Damn them all.

Her legs tucked under her, Miriam stared at the slate on her lap, at the delicate image of the portal it contained, as if willing herself to travel into the slate, shrinking down until she, too, could follow Michael Poole through the spacetime wormhole. If she concentrated really hard, she could shut out all the rest of it: this strange, rather chilling man from the future beside her,

the distant activities of the Friends, even the damned thin air and irregular gravity of the devastated earth-craft.

The moment stretched. The portal glimmered like a diamond on her slate.

Then, with shocking suddenness, blue-white light flared silently inside the portal, gushing from every one of the tetrahedral frame's facets. It was as if a tiny sun had gone nova inside the frame. The light of the wormhole's collapse glared from the slates carried by Parz, the Friends, as far as she could see; it was as if everyone held a candle before them, and the light generated by that failing spacetime flaw illuminated all their young, smooth faces.

The light died. When she looked again at her slate the portal was gone; broken fragments of the exotic-matter frame, sparking, tumbled away from a patch of space which had become ordinary, finite once more.

She threw the slate face down on the grass.

Jasoft Parz laid his slate more gently on the ground. 'It is over,' he said. 'Michael Poole has succeeded in sealing the wormhole; there can be no doubt.'

Berg shoved her fingers, hard, into the battered earth, welcoming the pain of bent-back nails. 'Those damn struts of exotic matter will have to be cleared. Hazard to navigation.'

He said, 'It is over, you know. You'll have to find ways of letting it go.'

'Letting what go?'

'The past.' He sighed. 'And, in my case, the future.'

She lifted her head, studied the huge, brooding bulk of Jupiter. 'The future is still yours ... your own future. There is plenty for you to explore here. And the Friends, of course.'

He smiled. 'Such as?'

'AS treatment for a start. And, for the first time in your lives, some modern - sorry, ancient - health checks.'

Jasoft smiled, quietly sad. 'But we are aliens on our native planet. Stranded so far from our own time ...'

She shrugged. 'There are plenty of you, including the Friends. And they're young, basically fit. You could found a colony; there's plenty of room. Or head for the stars.' She smiled, remembering the strange voyage of the *Cauchy*. 'Of course we don't yet have the hyperdrive to offer you.

Strictly sublight only ... But the wonder of the journey is no less for that, I can assure you.'

'Yes. Well, Miriam, such projects might attract these young people, if not me ...'

She looked at him now. 'What do you mean? What about you, Jasoft?'

He smiled and spread his long, age-withered fingers. 'Oh, I think my story is over now. I've seen, done, learned more than I ever dreamed. Or deserved to.'

Her eyes narrowed. 'You're going to refuse further AS treatment? Look, if you feel some guilt about the function you performed in the Qax Occupation Era, nobody in this age is going to—'

'It's not that,' he said gently. 'I'm not talking about some complicated form of suicide, my dear. And I don't suffer greatly from guilt, despite the moral ambivalence of what I've done with my life. I certainly believe I left my era for the last time aboard that damn Spline warship having done more good than harm ... It's just that I think I've seen enough. I know all I could wish to know, you see. I know that, although the Project of these rebels - the Friends of Wigner - has failed, Earth will ultimately be liberated from the grip of the Qax. I don't need to learn anything more. I certainly don't feel I need to see any more of it laboriously unfold. Do you understand that?'

Berg smiled. 'I think so. Though I must chide you for thinking small. The Friends of Wigner have projects which extend to the end of time.'

'Yes. And, as for their future, I suspect they are already engaged on designs of their own.'

She nodded. 'You've told me what Shira said. Take the long way home, by surviving through the centuries until the era of your birth returns ... and then what? Start the whole damn business over again?'

'Perhaps. Though I hear they've done a little more thinking since I spoke to Shira. You mention a sublight star trip. I think that would appeal to the Friends, if only because it would let them exploit relativistic time-dilation effects—'

'—and get home that bit quicker; in a century instead of fifteen.' She smiled. 'Well, it's one way to waste your life, I suppose.'

'And you, Miriam? You've been a century away yourself; this must be almost as great a dislocation for you as it is for me. What will you do?'

She shrugged, ruffling her hair. ‘Maybe I’ll go with the Friends,’ she murmured. ‘Maybe I’ll take them to the stars and back, journey through fifteen centuries once more—’

‘—and see if Michael Poole emerges into the Qax occupation future, dashing valiantly from the imploding wormhole?’ He smiled.

She looked up to the Jupiter-roofed zenith, trying to make out the pieces of the shattered portal. ‘It might make me feel better,’ she said. ‘But, Jasoft, I know I’ve lost Michael. Wherever he is now I can never reach him.’

They sat for a moment, watching images of shattered, tumbling exotic matter through the discarded slates. At length he said, ‘Come. It is cold here, and the air is thin. Let us return to the *Narlikar* boat. I would like some more warmth. And food.’

She dropped her head from the sky. ‘Yeah. That’s a good idea, Jasoft.’

She stood, her legs stiff after so long curled beneath her. Almost tenderly Jasoft took her arm, and they walked together to the waiting boat.

Spacetime is friable.

The fabric of spacetime is riddled with wormholes of all scales. At the Planck length and below, wormholes arising from quantum uncertainty effects blur the clean Einsteinian lines of spacetime. And some of the wormholes expand to the human scale, and beyond - sometimes spontaneously, and sometimes at the instigation of intelligence.

Spacetime is like a sheet of ice, permeated by flaws, by hairline cracks.

When Michael Poole’s hyperdrive was activated inside the human-built wormhole Interface, it was as if someone had smashed at that ice floe with a mallet. Cracks exploded from the point of impact, widened; they joined each other in a complex, spreading network, a tributary pattern which continually formed and reformed as spacetime healed and shattered anew.

The battered, scorched corpse of the Spline warship bearing the lifedome of the *Crab*, Michael Poole, and a cloud of rebellious antibody drones emerged from the collapsing wormhole into the Qax Occupation Era at close to the speed of light. Shear energy from the tortured spacetime of the wormhole transformed into high-frequency radiation, into showers of short-lived, exotic particles which showered around the tumbling Spline.

It was like a small sun exploding amid the moons of Jupiter. Vast storms were evoked in the bulk of the gas giant’s atmosphere, a world already

bearing the wound of the growing black holes in its heart. A moon was destroyed. Humans were killed, blinded.

Cracks in shattering spacetime propagated at the speed of light.

There was already another macroscopic spacetime wormhole in the Jovian system: the channel set up to a future beyond the destruction of the Qax star, the channel through which Qax had travelled towards the past, intent on destroying humanity.

Under the impact of Poole's hammer-blow arrival - as Poole had expected - this second spacetime flaw could not retain its stability.

The wormhole mouth itself expanded, exoticity ballooning across thousands of miles and engulfing the mass-energy of Michael Poole's unlikely vessel. The icosahedral exotic-matter frame which threaded the wormhole mouth exploded, a mirror image of the destruction witnessed by Miriam Berg fifteen centuries earlier. Then the portal imploded at lightspeed; gravitational shockwaves pulsed from the vanishing mouth like Xeelee starbreaker beams, scattering ships and moons.

Through a transient network of wormholes which imploded after him in a storm of gravity waves and high-energy particles, Michael Poole hurtled helplessly into the future.

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16

Chains of events threaded the future.

A human called Jim Bolder flew a Xeelee nightfighter into the heart of the Qax home system, causing them to turn their starbreaker weapons on their own sun.

The Qax occupation of Earth collapsed. Humans would never again be defeated, on a significant scale, by any of the junior species.

Humans spread across stars, their spheres of influence expanding at many times lightspeed. A period known as the Assimilation followed during which the wisdom and power of other species were absorbed, on an industrial scale.

Soon, only the Xeelee stood between humans and dominance.

The conflict that followed lasted a million years.

When it was resolved only a handful of humans, and human-derived beings, remained anywhere in the universe.

The Projects of the Xeelee, the inexorable workings of natural processes, continued to change the universe.

Stars died. More stars formed, to replace those which had already failed ... but as the primal mix of hydrogen and helium became polluted with stellar waste products, the formation rate of new stars declined exponentially.

And darker forces were at work. The stars aged ... too rapidly.

The Xeelee completed their great Projects, and fled the decaying cosmos.

Five million years after the first conflict between human and Qax, the wreckage of a Spline warship emerged, tumbling, from the mouth of a wormhole which blazed with gravitational radiation. The wormhole closed, sparkling.

The wreck - dark, almost bereft of energy - turned slowly in the stillness. It was empty of life.

Almost.

Quantum functions flooded over Michael Poole like blue-violet rain, restoring him to time. He gasped at the pain of rebirth.

Humans would call it the antiXeelee.

It was ... large. Its lofty emotions could be described in human terms only by analogy.

Nevertheless - the antiXeelee looked on its completed works and was satisfied.

Its awareness spread across light-years. Shining matter littered the universe; the Xeelee had come, built fine castles of that shining froth, and had now departed. Soon the stuff itself would begin to decay, and already the antiXeelee could detect the flexing muscles of the denizens of that dark ocean which lay below.

The function of the antiXeelee had been to guide the huge Projects of the Xeelee, the Projects whose purpose had been to build a way out of this deadly cosmos. In order to achieve their goals, the Xeelee had even moved back through time to modify their own evolution, turning their history into a closed timelike curve, a vacuum diagram. The antiXeelee was the consciousness driving this process, travelling - like an antiparticle - back in time from the moment of its dissolution to the moment of its creation.

Now the job was done. The antiXeelee felt something like contentment at the thought that its charges had escaped, were now beyond the reach of those ... others, who the Xeelee had in the end been unable to oppose.

The antiXeelee could let go.

It spread wide and thin; soon, with a brief, non-localized burst of selectrons and neutralinos its awareness would multiply, fragment, shatter, sink into the vacuum ...

But not yet. There was something new.

It didn’t take Michael long to check out the status of his fragile craft.

There was some power still available to the lifedome from its internal cells. That might last - what, a few hours? As far as he could tell, there was no functional link between the dome and the rest of the *Hermit Crab*, nor had the links set up by Harry to the Spline ship survived ... save for one, glowing telltale on the comms desks which Michael studiously ignored; the damn rebel drones could chew the ship up as far as he was concerned, now.

So he had no motive power. Not so much as an in-system boat; no way of adjusting his situation.

He didn’t grouse about this, nor did he fear his future, such as it was. It was a miracle he’d even survived his passage through the wormhole network ... This was all a bizarre bonus.

Harry was gone, of course.

The universe beyond the lifedome looked aged, dead, darkened. The lifedome was a little bubble of light and life, isolated.

Michael was alone, here at the end of time. He could feel it.

He gathered a meal together; the mundane chore, performed in a bright island of light around the life-dome's small galley, was oddly cheering. He carried the food to his couch, lay back with the plate balancing on one hand, and dimmed the dome lights.

God alone knew where he was ... if 'where' could have a meaning, after such a dislocation in spacetime. The stars were distant, dark, red. Could so long have passed? - or, he wondered, could something, some unknown force, have acted to speed the stars' aging in the aeons beyond the flashbulb slice of time occupied by humans?

There was no large-scale sign of human life, or activity; nor, indeed, of any intelligent life.

Intelligence would have had time to work, Michael reflected. After millions of years, with a faster-than-light hyperdrive and singularity technology in the hands of hundreds of species, the universe should have been transformed ...

The reconstruction of the universe should have been as obvious as a neon sign a thousand light-years tall.

... But the universe had merely aged.

He knew from the subjective length of his passage through the wormholes that he couldn't have travelled through more than a few million years - a fraction of the great journey to timelike infinity - and yet already the tide of life had receded. Were there any humans left, anywhere?

He smiled wistfully. So much for Shira's grand dreams of life covering the universe, of manipulating the dynamic evolution of spacetime itself ...

There would be no 'Ultimate Observer', then. The Project of the Friends of Wigner could not, after all, have succeeded: there would have been nobody to hear the elaborately constructed message. But, Michael thought as he gazed out at the decayed universe, by God it had been a grand conception. To think of finite humans, already long since dust, even daring to challenge these deserts of time ...

He finished his food, set the plate carefully on the floor. He drank a glass of clean water, went to the free-fall shower, washed in a spray of hot

water. He tried to open up his senses, to relish every particle of sensation. There was a last time for everything, for even the most mundane experiences.

He considered finding some music to play, a book to read. Somehow that might have seemed fitting.

The lights failed. Even the comms telltale from the drones winked out.

Well, so much for reading a book.

By the dimmed starlight, half by touch, he made his way back to his couch.

It grew colder; he imagined the heat of the lifedome leaking out into the immense heat sink of the blackened, ancient sky. What would get him first? - the cold, or the failing air?

He wasn't afraid. Oddly, he felt renewed: young, for the first time in a subjective century, the pressure of time no longer seeming to weigh on him.

Perhaps he was finding that peace of death, the readiness to abandon the cares of a too-long life, which his father had discovered before him. And he found, at last, a contentment that he had lived long enough to see all he had.

He crossed his hands on his chest. He was beginning to shiver, the air sharp in his nostrils. He closed his eyes.

Something like curiosity, a spark of its awareness, stirred the antiXeelee.

Here was an artifact.

How had this cooling wreckage got here, to this place and time?

There was something inside it. A single, flickering candle of consciousness ...

The antiXeelee reached out.

There was a ship, another ship, hanging over the lifedome.

Michael, dying, stared in wonder.

It was something like a sycamore seed wrought in jet black. No lights showed in the small, pod-like hull. Nightdark wings which must have spanned hundreds of miles loomed over the wreck of the *Crab*, softly rippling.

The Friends of Wigner had told Michael of ships like this. This was a nightfighter, the wings sheet-discontinuities in the fabric of spacetime.

Xeelee.

The cold sank claws into his chest; the muscles of his throat abruptly spasmed, and dark clouds ringed his vision.

Not now, he found himself pleading silently, his failing vision locked onto the Xeelee ship, all his elegiac acceptance gone in a flash. *Just a little longer. I have to know what this means. Please ...*

The antiXeelee plucked the guttering flame from the candle.

The last heat fled from the wrecked craft; the air in the translucent dome began to frost over the comms panels, the couches, the galley, the abandoned body.

The antiXeelee cupped the flame, almost amused by its tiny fear, its wonder, its helpless longing to survive.

The flame was spun out into a web of quantum functions, acausal and nonlocal.

Michael was - discorporeal; it was as if the jewel of consciousness which had lain behind his eyes had been plucked out of his body and flung into space.

He did not even have heartbeats to count.

But there was something here with him, he sensed: some - entity. It was like a great ceiling under which he hovered and buzzed, insect-like. He sensed a vast, satisfied weariness in its mood, the contentment of the traveller at the end of a long and difficult road. For a long time he stayed within the glow of its protection.

Then it began to dissolve.

Michael wanted to cry out, like a child seeking its huge parent. He was buffeted, battered. It was as if a glacier of memories and emotions was calving into a hundred icebergs around him; and now those icebergs in turn burst into shards which melted into the surface of a waiting sea ...

And he was left alone.

It was impossible to measure time, other than by the slow evolution of his own emotions.

He endured despair. Why had he been brought to this point in spacetime, preserved in such a fashion, and then so casually abandoned?

The despair turned to anger, and lasted a long time.

But the anger faded.

He became curious and began to experiment with his awareness. Physically he seemed to be composed of a tight knot of quantum wave

functions; now, cautiously, he began to unravel that knot, to allow the focus of his consciousness to slide over spacetime. Soon it was as if he was flying over the arch of the cosmos, unbound by limits of space or time.

Throughout the galaxy he found the works of man. He lingered over places and artifacts abandoned by history, dwelling as long over a drifting child's toy as over some huge spacebound fortress.

Everywhere he found relics of war. Ruined stars and worlds, squandered energy. But he found no people - no sentience - anywhere.

At first Michael labelled the places he visited, the relics he found, in human terms; but as time passed and his confidence grew he removed this barrier of conscious thought. He allowed his consciousness to soften further, to dilute the narrow human perception to which he had clung.

All about him were quantum wave functions. They spread from stars and planets, sheets of probability that linked matter and time. They were like spiders' webs scattered over the aging galaxies; they mingled, reinforced and cancelled each other, all bound by the implacable logic of the governing wave equations.

The functions filled spacetime and they pierced his soul. Exhilarated, he rode their gaudy brilliance through the hearts of aging stars.

He relaxed his sense of scale, so that there seemed no real difference between the width of an electron and the depth of a star's gravity well. His sense of time telescoped, so that he could watch the insect-like, fluttering decay of free neutrons - or step back and watch the grand, slow decomposition of protons themselves ...

Soon there was little of the human left in him.

Then, at last, he was ready for the final step.

Human consciousness was an artificial thing. Once humans had believed that gods animated their souls, fighting their battles in the guise of humans. Later they had evolved the idea of the self-aware, self-directed consciousness. Now Michael saw that it had all been no more than an idea, a model, an illusion behind which to hide.

He, the last man, need no longer cling to such outmoded comforts.

There was no cognition, he realized. There was only perception.

With the equivalent of a smile he relaxed. His awareness sparkled and subsided.

He was beyond time and space. The great quantum functions which encompassed the universe slid past him like a vast, turbulent river, and his eyes were filled with the grey light which shone beneath reality, the light against which all phenomena are shadows.

Time wore away, unmarked.

And then ...

There was a box, drifting in space, tetrahedral, clear-walled.

From around an impossible corner a human walked into the box. He was dressed in treated animal skins. He was gaunt, encrusted in filth, his skin ravaged by frost.

He stared out at the stars, astonished.

Michael’s extended awareness stirred. Something had changed.

History resumed.

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1

Dura woke with a start.

There was something wrong. The photons didn’t smell right.

Her hand floated before her face, dimly visible, and she flexed her fingers. Disturbed electron gas, spiralling dizzily around the Magfield lines, sparkled purple-white around the fingertips. The Air in her eyes was warm, stale, and she could make out only vague shapes.

For a moment she hung there, curled in a tight ball, suspended in the elastic grip of the Magfield.

She heard voices, thin and hot with panic. They were coming from the direction of the Net.

Dura jammed her eyes tight shut and hugged her knees, willing herself to return to the cool oblivion of sleep. *Not again. By the blood of the Xeelee*, she swore silently, *not another Glitch; not another spin storm*. She wasn’t sure if the little tribe of Human Beings had the resources to respond to more disruption ... nor, indeed, if she herself had the strength to cope with fresh disaster.

The Magfield itself trembled now. Encasing her body, it rippled over her skin, not unpleasantly, and she allowed it to rock her as if she were a child in its arms. Then - not so pleasantly - it prodded her more rudely in the small of the back ...

No, that wasn’t the Magfield. She uncurled again, stretching against the confines of the field. She rubbed her eyes - the fleshy rims of the cups were crusted with sleep-deposits and felt sharp against her fingers - and shook her head to clear the clouded Air out of the cups.

The prod in her back was coming from the fist of Farr, her brother. He’d been on latrine duty, she saw; he still carried his plaited waste bag, empty of the neutron-rich shit he’d taken out away from the Net and dumped in the Air. His skinny, growing body trembled in response to the instabilities in the Magfield and his round face was upturned to her, creased with an almost comical concern. In one hand he gripped a fin of his pet Air-pig - a fat infant about the size of Dura’s fist, so young that none of its six fins were yet pierced. The little animal, obviously terrified by the Glitch, struggled to escape, feebly; it pumped out superfluid jetfarts in thin blue streams.

His fondness for the animal made Farr seem even younger than his twelve years - a third of Dura's age - and he clung to the piglet as if clinging to childhood itself. Well, Dura thought, the Mantle was huge and empty, but there was precious little room in it for childhood. Farr was having to grow up fast.

He was so like their father, Logue.

Dura, still misty with sleep, felt a surge of affection and concern for the boy and reached out to stroke his cheek, to run gentle fingers around the quiet brown rims of his eyes.

She smiled at her brother. 'Hello, Farr.'

'Sorry for waking you.'

'You didn't. The Star was kind enough to wake me, long before you got around to it. Another Glitch?'

'The worst one yet, Adda says.'

'Never mind what Adda says,' Dura said, stroking his floating hair; the hollow tubes were, as always, tangled and grubby. 'We'll get by. We always do, don't we? You get back to your father. And tell him I'm coming.'

'All right.' Farr smiled at her again, twisted stiffly, and, with his Air-pig's fin still clutched tight, he began to Wave awkwardly across the Magfield's invisible flux paths towards the Net. Dura watched him recede, his slim form diminished by the shimmering, world-filling vortex lines beyond him.

Dura straightened to her full length and stretched, pressing against the Magfield. She kept her mouth wide open as she worked stiffness out of her limbs and back. She felt the feathery ripple of the Air as it poured through her throat to her lungs and heart, rushing through superleak capillaries and filling her muscles; her body seemed to tingle with its freshness.

She gazed around, sniffing the photons.

Dura's world was the Mantle of the Star, an immense cavern of yellow-white Air bounded below by the Quantum Sea and above by the Crust.

The Crust itself was a rich, matted ceiling, purple-streaked with grass and the hairlike lines of tree trunks. By squinting - distorting the parabolic retinae of her eyes - she could make out dark motes scattered among the roots of the trees fixed to the underside of the Crust. Perhaps they were rays, or a herd of wild Air-pigs, or some other grazing creatures. It was too distant to see clearly, but the amphibian animals seemed to be swirling

around each other, colliding, confused; she almost imagined she could hear the cool sound of their distress.

Far below her, the Quantum Sea formed a purple-dark floor to the world. The Sea was mist-shrouded, its surface indistinct and deadly. The Sea itself, she saw with relief, was undisturbed by the Glitch. Only once in Dura's memory had there been a Glitch severe enough to cause a Seaquake. She shuddered like the Magfield as she remembered that ghastly time; she had been no older than Farr, she supposed, when the neutrino founts had come, sweeping half the Human Beings - including Phir, Dura's mother and Logue's first wife - away and on, screaming, into the mysteries beyond the Crust.

All around her, filling the Air between Crust and Sea, the vortex lines were an electric-blue cage. The lines filled space in a hexagonal array, spaced about ten mansheights apart; they swept around the Star from far upflux - from the North - arced past her like the trajectories of immense, graceful animals, and converged into the red-soft blur that was the South Pole, millions of mansheights away.

She held her fingers up before her face, trying to judge the spacing and pattern of the lines.

Through her fingers she could see the encampment, a little knot of frantic detail and activity - jostling, terrified Air-pigs, scrambling people, the quivering Net - all embedded in the shuddering bulk of the Air. Farr with his struggling Air-piglet was a pathetic scrap, wriggling through the invisible flux tubes.

Dura tried to ignore the small, messy knot of humanity, to focus on the lines.

Normally the motion of the lines was stately, predictable - regular enough for the Human Beings to measure their lives by it, in fact. Overlaid on the eternal drift of the lines towards the Crust there were pulses of line-bunching: the tight, sharp crowdings that marked the days, and the slower, more complex second-order oscillations which humans used to count their months. In normal times it was easy for the Human Beings to avoid the slow creep of the lines; there was always plenty of time to dismantle the Net, repitch their little encampment in another corner of the empty sky.

Dura even knew what caused the lines' stately pulsations, much good the knowledge did her: the Star had a companion, far beyond the Crust - a

planet, a ball like the Star but smaller, lighter - which revolved, unseen, over their heads, pulling at the vortex lines as if with invisible fingers. And, of course, beyond the planet - the childish ideas returned to her unbidden, like fragments of her lingering sleep - beyond the planet were the stars of the Ur-humans, impossibly distant and forever invisible.

The drifting vortex lines were as stable and secure, in normal times, as the fingers of some friendly god; humans, Air-pigs and others moved freely between the lines, fearlessly and without any danger ...

Except during a Glitch.

Now, across the frame of her spread fingers, the vortex array was shifting visibly as the superfluid Air sought to realign with the Star's adjusted rotation. Instabilities - great parallel sets of ripples - already marched majestically along the length of the lines, bearing the news of the Star's new awakening from Pole to magnetic Pole.

The photons emitted by the lines smelled thin, sharp. The spin storm was coming.

Dura had chosen a sleep place about fifty mansheights from the centre of the Human Beings' current encampment, in a place where the Magfield had felt particularly thick, comfortingly secure. Now she began to Wave towards the Net. Wriggling, rippling her limbs, she felt electricity course through her epidermis; and she pushed with arms and legs at the invisible, elastic resistance of the Magfield as if it were a ladder. Fully awake now, she found herself filled with a belated anxiety - an anxiety healthily laced with guilt at her tardiness - and as she slid across the Magfield she spread the webbed fingers of her hands and beat at the Air, trying to work up still more speed. Neutron superfluid made up most of the bulk of the Air, so there was barely any resistance to her hands; but still she clawed at the Air, her impatience mounting, seeking comfort in activity.

The vortex lines slid like dreams across her field of vision now. Ripples hurtled in great even chains, as if the vortex lines were ropes shaken by giants located in the mists of the Poles. As the waves beat past her they emitted a low, cool groan. The amplitude of the waves was already half a mansheight. *By Bolder's guts*, she thought, *maybe that old fool Adda is right for once; maybe this really is going to be the worst yet.*

Slowly, painfully slowly, the encampment grew from a distant abstraction, a melange of movement and noise, to a community. The

encampment was based around the crude cylindrical Net made of plaited tree-bark, slung out along the Magfield lines. Most people slept and ate bound up to the Net, and the length of the cylinder was a patchwork of tied-up belongings, privacy blankets, cleaning brushes, simple clothes - ponchos, tunics and belts - and a few pathetic bundles of food. Scraps of half-finished wooden artifacts and flags of untreated Air-pig leather dangled from the Net ropes.

The Net was five mansheights across and a dozen long. It was at least five generations old, according to the older folk like Adda. And it was the only home of about fifty humans - and their only treasure.

As she neared it, clawing her way through the clinging Magfield, Dura suddenly saw the flimsy construct with an objective eye - as if she had not been born in a blanket tied to its filthy knots, as if she would not die still clinging to its fibres. How fragile it was: how pathetic, how defenceless they truly were. Even as she approached to join her people in this moment of need, Dura felt depressed, weak, helpless.

The adults and older children were Waving all around the Net, working at knots which dwarfed their fingers. She saw Esk, picking patiently at a section of the Net. Dura thought he watched her approach, but it was hard to be sure. In any event Philas, his wife, was with him, and Dura kept her face averted. Here and there Dura could make out small children and infants still attached to the Net by tethers of varying lengths. Each child, left tethered up by labouring parents and siblings, was a small, wailing bundle of fear and loneliness, Waving futilely against its constraints, and Dura felt her heart go out to every one of them. Dura spotted the girl Dia, heavily pregnant with her first child. Working with her husband Mur, Dia was pulling tools and bits of clothing from the Net and stuffing them into a sack; Air-sweat glistened from her swollen, naked belly. Dia was a small-limbed, childlike woman whose pregnancy had served to make her only more vulnerable and young-looking; watching her work now, her every movement redolent of fear, made something move inside childless Dura, an urge to protect.

The animals - the tribe’s small herd of a dozen adult Air-pigs and about as many piglets - were restrained inside the Net, along its axis. They bleated, their din adding a mournful counterpoint to the shouts and cries of humans; they huddled together at the heart of the Net in a trembling mass of fins, jet orifices and stalks erect with huge, bowl-shaped eyes. A few people

had gone inside the Net and were trying to calm the animals, to attach leaders to their pierced fins. But the dismantling of the Net was proceeding slowly and unevenly, Dura saw as she approached, and the herd was a mass of panicky noise, uncoordinated movement.

She heard voices raised in fear and impatience. What had seemed from a little further away to be a reasonably controlled operation was actually little more than a shambles, she realized.

There was something in her peripheral vision - a motion, blue-white and distant ... More ripples in the vortex tubes, coming from the distant North: immense, jagged irregularities utterly dwarfing the small instabilities she'd observed so far.

There wasn't much time.

Logue, her father, hung in the Magfield a little way from the Net. Adda, too old and slow for the urgent work of dismantling the encampment, hovered beside Logue, his thin face twisted, sour. Logue bellowed out orders in his huge baritone, but, Dura could already see, with very little effect on the Human Beings' coordination. Still Dura had that odd feeling of timelessness, of detachment, and she studied her father as if meeting him for the first time in many weeks. Logue's hair, plastered against his scalp, was crumpled and yellowed; his face was a mask through which the round, boyish features shared by Farr could still be discerned, obscured by a mat of scars and wrinkles.

As Dura approached, Logue turned to her, his brown eyecups wide, his cheek muscles working. 'You took your time,' he growled at her. 'Where have you been? You're needed here. Can't you see that?'

His words cut through her detachment, and despite herself, despite the urgency of the moment, she felt resentment building in her. 'Where? I've been to the Core in a Xeelee nightfighter. Where do you think I've been?'

Logue turned from her in apparent disgust. 'You shouldn't blaspheme,' he muttered.

She wanted to laugh. Impatient with him, with herself, with the continual friction between them, she shook her head. 'Oh, into the Ring with it. What do you want me to do?'

Now old Adda leaned forward, the open pores among his remaining hair sparkling Air-sweat. 'Don't know there's much you *can* do,' he said sourly. 'Look at them. What a shambles.'

‘We’re not going to make it in time, are we?’ Dura asked him. She pointed North. ‘Look at that ripple. We won’t get out of the way before it hits.

‘Maybe. Maybe not.’ The old man raised his empty eyes to the South Pole; its soft glow illuminated the backs of his eyes, the cup-retinae there; fragments of debris swirled around the rims and tiny cleansing symbiotes swam constantly in and out of the cups.

Logue bellowed suddenly, ‘Mur, you damn fool. If that knot is stuck then cut it. Rip it. Gnaw it through if you have to! - but don’t just leave it there, or half the Net is going to go flapping off into the Quantum Sea when the storm hits us ...’

‘Worst I’ve ever seen,’ Adda muttered, sniffing. ‘Never known the photons to smell so sour. Like a frightened piglet ... Of course,’ he went on after a few moments, ‘I remember one spin storm when I was a kid ...’

Dura couldn’t help but smile. Adda was the wisest amongst them, probably, about the ways of the Star. But he relished his role as doomsayer ... he could never let go of the mysteries of his own past, of the wild, deadly days which only he could remember ...

Logue turned on her with fury, his face as unstable as the quivering Magfield. ‘While you grin, we could die,’ he hissed.

‘I know.’ She reached out and touched his arm, feeling the hot tide of Air which superleaked from his clenched muscles. ‘I know. I’m - sorry.’

He frowned, staring at her, and reached forward, as if to touch her. But he drew the hand back. ‘Perhaps you’re not as strong as I like to think you are.’

‘No,’ she said quietly. ‘Perhaps I’m not.’

‘Come,’ he said. ‘We’ll help each other. And we’ll help our people. No one’s dead yet, after all.’

Dura scrambled across the Magfield flux lines to the Net. Men, women and older children were gathered in tight huddles, their thin bodies bumping together as they floated in the turbulent Magfield, labouring at the Net. They cast fearful, distracted glances at the approaching vortex instabilities, and from all around the Net Dura could hear muttered - or shouted - prayer-chants, pleas for the benevolence of the Xeelee.

Watching the Human Beings, Dura realized they were huddling together for *comfort*, not for efficiency. Rather than working evenly and

systematically around the Net, the people were actually impeding each other from working effectively at the dismantling; whole sections of the tangled Net were being left unattended.

Dura's feeling of depressed helplessness deepened. Perhaps she could help them organize better - act as Logue's daughter for once, she admonished herself wearily, act as a *leader*. But as she studied the frightened faces of the Human Beings, the round, staring eyecups of the children, she recognized the weary terror which seemed to be numbing her own reactions.

Maybe huddling and praying was as rational a response as any to this latest disaster.

She twisted in the Air and Waved towards an empty section of Net, keeping well away from Esk and Philas. Logue would have to do the leading; Dura would remain one of the led.

The first of the massive ripples neared the encampment. Feeling the growing tension in the Air, Dura grasped the Net's sturdy rope and pulled her body against its shuddering bulk. For a moment her face was pressed against the Net's thick mesh, and she found herself staring at an Air-pig, not an arm's length from her. The rope-threaded holes punched through its fins were widened with age, ringed by scar tissue. The Air-pig seemed to be looking into her eyes, its six eyestalks pushed straight out from its brain pan, the cups swivelled at her. The beast was one of the oldest of the Air-pigs - as a kid, she recalled wistfully, she would have known the names of each one of the meagre herd - and it must have seen plenty of spin storms before. *Well*, she thought. *What's your diagnosis? Do you think we've a chance of getting through this storm any better than we have all the others? Will* you *live to see the other side of it? What do you think?*

The creature's fixed, mournful stare, the brown depths of its eyecups, afforded her no reply. But its musty animal warmth stank of fear.

The mat of rope before her face glimmered suddenly, blue-white; her head cast a shadow before her.

She turned to see that one vortex line had drifted to within a couple of mansheights of her position; it shimmered in the Air, quivering, a cable emitting an electric-blue glow almost too clamorous for her eyes.

The tribesfolk appeared to have given up any attempts at dismantling the Net; even Logue and Adda had come Waving across to the illusory

safety of the habitat. People simply clung on where they were, arms wrapped around each other and around the smallest of the children, the opened-up Net flapping uselessly around them. The crying of children resounded.

And now, with sudden brutality, the spin storm hit. A jagged discontinuity a mansheight deep surged along the nearest vortex line past the Net, faster than any human could Wave, faster even than any wild Air-pig could jet through the Air. Dura tried to concentrate on the solidity of the fibrous rope in her hands, the comforting Magfield which, as always, confined her body with a gentle grip ... But it was impossible to ignore the sudden thickness of the Air in her lungs, the roaring heat-noise blasting through the Air so powerfully she feared for her ears, the quivering of the Magfield.

She clenched her eyes closed so hard that she could feel the Air in the cups squeeze away. *Concentrate*, she told herself. *You understand what's happening here. That wretched Air-pig, bound up inside the Net, is as ignorant as the youngest piglet in its first storm. But not you; not a Human Being.*

And it is through understanding that we will prevail . . . But, even as she intoned the words to herself like a prayer, she could not find any truth in that pious hope.

The Air was a neutron liquid, a superfluid. Superfluids could not sustain spin over extended distances. So, in response to the rotation of the Star, the Air became filled with vortex lines, tubes of vanishing thinness within which the Air's rotation was confined. The vortex lines aligned themselves in regular arrays, aligned with the Star's rotation axis - closely parallel to the magnetic axis followed by the Magfield. The vortex lines filled the world. They were safe as long as you stayed away from them; every child knew that. But in a Glitch, Dura thought ruefully, the lines sometimes came looking for you ... and the Air's superfluidity broke down around a collapsing vortex line, transforming the Air from a thin, stable, lifegiving fluid into a thing of turmoil and turbulence.

The worst of the first spin gust seemed to be passing now. Still clinging to the Net, she opened her eyes and cast rapidly around the sky.

The vortex lines, parallel beams receding into infinity, were still marching grandly across the sky, seeking their new alignment. It was quite a

magnificent sight; and for a moment Dura felt wonder thrill through her as she imagined the arrays of spin lines which stretched right around the Star realigning, gathering and spreading, as if the Star were bound up in the integrated thoughts of some immense mind.

The Net shuddered in her grip, its coarse fibres abrading her palms; the sharp pain jolted her rudely back to the here and now. She sighed, gathering her strength, as weariness closed around her again.

‘Dura! Dura!’

The childish voice, thin and scared, came drifting to her from a few mansheights away. Gripping the Net with one hand, she twisted to see Farr, her little brother, suspended in the Air like a discarded fragment of cloth and flesh. He was Waving towards her.

When Farr reached her, Dura enfolded him in her free arm, helping him wrap his arms and legs around the security of the Net’s ropes. He was breathing hard and trembling, and she could see the short hairs which coated his scalp pulsing as superfluid surged through them.

‘I was thrown off,’ he gasped between gulps of Air. ‘I lost my piglet.’

‘So I see. Are you okay?’

‘I think so.’ He stared up at her, his eyes wide and empty, and he raked his gaze across the sky as if searching for the source of this betrayal of his safety. ‘This is terrible, isn’t it, Dura? Are we going to die?’

She ran her fingers casually through his stiff hair. ‘No,’ she said, with a conviction she could never have mustered for herself alone. ‘No, we won’t die. But we are in danger. Now come on, we should get to work. We need to get the Net taken apart, folded up, before the next instability hits us and wrecks it.’ She pointed to a small, open-looking knot. ‘There. Undo that. As quick as you can.’

He buried his trembling fingers in the knot and began prising out lengths of rope. ‘How long before the next ripple?’

‘Long enough to finish the job,’ she said firmly. For confirmation, with her own fingers still dragging at the stubborn knots, she glanced upflux - Northwards - to the source of the next ripple.

Instantly she saw how wrong she had been. From around the Net she heard voices raised in wonder and rising alarm; within a few heartbeats, it seemed, she was hearing the first screams.

The next ripple was closing on them; already she could hear its rising clamour of heat fluctuations. This new instability was huge, at least five or six mansheights deep. Dura watched, mesmerized, her hands frozen. Already the ripple was hurtling at her faster than any she could remember, and as it approached its amplitude seemed to be deepening, as if it were feeding on Glitch energy. And, of course, with greater amplitude came still greater speed. The instability was a complex superposition of wave shapes clustered along the length of the migrating vortex line, a superposition which spiralled around the line like some malevolent animal clambering towards her ...

Farr said, ‘We can’t escape that. Can we, Dura?’

There was a moment of stillness, almost of calm. Farr’s voice, though still cracked by adolescence, had sounded suddenly full of a premature wisdom. It was some comfort that Dura wasn’t going to have to lie to him.

‘No,’ she said. ‘We’ve been too slow. I think it’s going to hit the Net.’ She felt distant from the danger around her, as if she were recalling events from long ago, far away.

Even as it rushed up towards them the ripple bowed away from the trend of the vortex line in ever more elaborate, fantastic shapes. It was as if some elastic limit had been passed and the vortex line, under intolerable strain, was yielding.

It was almost beautiful, captivating to watch. And it was only mansheights away.

She heard the thin voice of old Adda, from somewhere on the other side of the Net. ‘Get away from the Net. Oh, get away from the Net!’

‘Do as he says. Come on.’

The boy slowly lifted his head; he still clung to the rope, and his eyes were empty, as if beyond fear or wonder. She drove a fist into one of his hands. ‘Come on!’

The boy cried out and withdrew his hands and legs from the Net, staring at her with a round face full of betrayal ... but a face that looked once more like that of an alert child rather than a bemused, petrified adult. Dura grabbed his hand. ‘Farr, you have to Wave as you’ve never Waved before. Hold my hand; we’ll stay together ...’

With a thrust of her legs she pushed away. For the first moments she seemed to be dragging Farr behind her; but soon his body was Waving in

synchronization with hers, wriggling against the cloying thickness of the Magfield, and the two of them hurried away from the doomed Net.

As she Waved, gasping, Dura looked back. The spin instability, recoiling, wafted through the Air like a deadly, blue-white wand. It scythed towards the Net with its cargo of wriggling humans. It was like some wonderful toy, Dura thought; it glowed intensely brightly, and the heat-noise it emitted was a roar, almost drowning out thought itself. The bleating of trapped Air-pigs was cold-thin, and Dura thought briefly of the old animal with whom she had shared that brief, odd moment of half-communication; she wondered how much that poor creature understood of what was to happen.

Maybe half the Human Beings had heeded Adda's advice to get away. The rest, apparently paralysed by fear and awe, still clung to the Net. The pregnant Dia was lumbering away into the Air with Mur; the woman Philas still picked frantically, uselessly, at the Net, despite the pleas of her husband Esk to come away. It was as if, Dura thought, Philas imagined that the work was a magic spell which would drive the instability away.

Dura knew that rotation instabilities lost energy rapidly. Soon, very soon, this fantastic demon would wither to nothing, leaving the Air calm and empty once more. And, glowing, roaring, stinking of sour photons, the instability was indeed visibly shrinking as it bore down on the Net.

But, it was immediately obvious, not shrinking fast enough ...

With a heat-wail like a thousand voices the instability tore into the Net.

It was like a fist driving into cloth.

The Air inside the Net ceased to be superfluid and became a stiff, turbulent mass, whipping and whorling around the vortex instability like some demented animal. Dura saw knots burst open; the Net, almost gracefully, disintegrated into fragments of rope, into rough mats to which adults and children clung.

The Air-pig herd was hurled away into the Air as if scattered by a giant hand. Dura could see how some of the beasts, evidently dead or dying, hung where they were thrown, limply suspended against the Magfield; the rest squirted away through the Air, their bellow-guts puffing out farts of blue gas.

One man, clinging alone to a raft of rope, was sucked towards the instability itself.

It was too far away to be sure, but Dura thought she recognized Esk. Dozens of mansheights from the site of the Net, she was much too far away even to call to him - let alone to help - but nevertheless she seemed to see what followed as clearly as if she rode at her lost lover’s shoulder towards the deadly arch.

Esk, with his mat of rope, tumbled through the plane of the quivering, arch-shaped instability and was hurled around the arch itself, as limp as a doll. His trajectory rapidly lost energy and, unresisting, he spiralled inwards, orbiting the arch like some demented Air-piglet.

Esk’s body burst open, the chest and abdominal cavities peeling back like opening eyes, the limbs coming free almost easily, like a toy’s.

Farr cried out, wordless. It was the first sound he’d made since they’d pushed away from the Net.

Dura reached for him and clutched his hand, hard. ‘Listen to me,’ she shouted over the arch’s continuing heat-clamour. ‘It looked worse than it was. Esk was dead long before he hit the arch.’ And that was true; as soon as he had entered the region in which superfluidity broke down, the processes of Esk’s body - his breathing, his circulatory system, his very muscles, all reliant on the exploitation of the Air’s superfluidity - would have collapsed. To Esk, as the strength left his limbs, as the Air coagulated in the superleak capillaries of his brain, it must have been like falling gently asleep.

She thought. She hoped.

The instability passed through the site of the Net and sailed on into the sky, continuing its futile mission towards the South. But even as Dura watched, the arch shape was dwindling, shrinking, its energy expended.

It left behind an encampment which had been torn apart as effectively as poor Esk’s body.

Dura pulled Farr closer to her, easily overcoming the gentle resistance of the Magfield, and stroked his hair. ‘Come on,’ she said. ‘It’s over now. Let’s go back, and see what we can do.’

‘No,’ he said, clinging to his sister. ‘It’s never over. Is it, Dura?’

Little knots of people moved through the glistening, newly stable vortex lines, calling to each other. Dura Waved between the struggling groups, searching for Logue, or news of Logue; she kept a tight grip on Farr’s hand.

‘Dura, help us! Oh, by the blood of the Xeelee, help us!’

The voice came to her from a dozen mansheights away; it was a man's - thin, high and desperate. She turned in the Air, searching for its source.

Farr took her arm and pointed. 'There. It's Mur, over by that chunk of Net. See? And it looks as if he's got Dia with him.'

Heavily pregnant Dia ... Dura pulled at her brother's hand and Waved rapidly through the Air.

Mur and Dia hung alone in the Air, naked and without tools. Mur was holding his wife's shoulders and cradling her head. Dia was stretched out, her legs parting softly, her hands locked around the base of her distended belly.

Mur's young face was hard, cold and determined; his eyes were pits of darkness as he peered at Dura and Farr. 'It's her time. She's early, but the Glitch ... You'll have to help me.'

'All right.' Dura lifted Dia's hands away from her belly, gently but firmly, and ran her fingers quickly over the uneven bulge. She could feel the baby's limbs pushing feebly at the walls which still restrained it. The head was low, deep in the pelvis. 'I think the head's engaged,' she said. Dia's young, thin face was fixed on hers, contorted with pain; Dura tried to smile at her. 'It feels fine. A little while longer ...'

Dia hissed, her face creased with pain, 'Get on with it, damn you.'

'Yes.'

Dura looked around desperately; the Air around them was still empty, the nearest Human Beings dozens of mansheights away. They were on their own.

She closed her eyes for a moment, trying to resist the temptation to search the Air for Logue. She delved deep inside herself, looking for strength.

'It's going to be all right,' she said. 'Mur, hold her neck and shoulders. You'll have to brace her there; if you Wave a little you'll hold yourself in place, and ...'

'I know what to do,' Mur snapped. Still holding Dia's small head against his chest, he grasped her shoulders and Waved slowly, his strong legs beating at the Air.

Dura felt awkward, inadequate. *Damn it,* she thought, aware of the pettiness of her own reaction, *damn it, I've never done this on my own before. What do they expect?*

What next? ‘Farr, you’ll have to help me.’

The boy hovered in the Air a mansheight away, his mouth gaping. ‘Dura, I ...’

‘Come on, Farr, there’s nobody else,’ Dura said. As he came close to her she whispered, ‘I know you’re frightened. I’m frightened too. But not as much as Dia. It’s not so difficult as all that, anyway. We’ll do fine ...’

As long as nothing goes wrong, she thought.

‘All right,’ Farr said. ‘What do I do?’

Dura took hold of Dia’s right leg, wrapping her fingers tightly around the lower calf. The woman’s muscles were trembling and slick with Air-sweat, and Dura could feel the legs pushing apart; Dia’s vagina was opening like a small mouth, popping softly. ‘Take her other leg,’ she told Farr. ‘Like I’ve done. Get a tight hold; you’re going to have to pull hard.’

Farr, hesitant and obviously scared, did as he was told.

The baby moved, visibly, further into the pelvic area. It was like watching a morsel of food disappear down some huge neck. Dia arched back her head and moaned; the muscles in her neck were stiff and prominent.

‘It’s time,’ Dura said. She glanced around quickly. She and Farr were in position, holding Dia’s ankles; Mur was already Waving, quite hard, pushing at his wife’s shoulders, so that the little ensemble drifted slowly through the Air. Both Mur’s and Farr’s eyes were locked on Dura’s face.

Dia called out again, wordlessly.

Dura leaned back, grasping Dia’s calf, and pushed firmly with her legs at the Magfield. ‘Farr! Do what I’m doing. We have to open her legs. Go on; don’t be afraid.’

Farr watched her for a moment, then leaned back and Waved in a copy of his sister’s movements. Mur cried out and shoved hard at his wife’s shoulders, balancing Farr and Dura.

Dia’s legs parted easily. She screamed.

Farr’s hands slid over Dia’s convulsing calf; in his shock he seemed to stumble in the Air, his eyes wide. Dia’s thighs twitched back towards each other, the muscles shuddering.

‘No!’ Mur shouted. ‘Farr, keep going; you mustn’t stop now!’

Farr’s distress was evident. ‘But we’re hurting her.’

‘No.’

Damn it, Dura thought, *Farr should know what's happening here*. Dia's pelvis was hinged; with the birth so close the cartilage locking the two segments of the pelvis together would have dissolved into Dia's blood, leaving her pelvis easily opened. Her birth canal and vagina were already stretching, gaping wide. Everything was working together to allow the baby's head an easy passage from the womb to the Air. *It's easy*, Dura thought. *And it's easy because the Ur-humans designed it to be easy, maybe even easier than for themselves . . .*

'It's meant to be like this,' she shouted at Farr. 'Believe me. You'll hurt her if you stop now, if you don't help us. And you'll hurt the baby.'

Dia opened her eyes. The cups brimmed with tears. 'Please, Farr,' she said, reaching towards him vaguely. 'It's all right. Please.'

He nodded, mumbling apologies, and pulled once more at Dia's leg.

'Easy,' Dura called, trying to match his motion. 'Not too fast, and not jerkily; nice and smooth ...'

The birth canal gaped like a green-dark tunnel. Dia's legs parted further than it would have seemed possible; Dura could see, under the thin flesh around the girl's hips, how the pelvis had hinged wide.

Dia screamed; her stomach convulsed.

The baby came suddenly, wriggling down the birth passage like an Air-piglet. It squirted into the Air with a soft, sucking noise; droplets of dense, green-gold Air sprayed around it. As soon as it was out of the canal the baby started to Wave, instinctively but feebly, across the Magfield within which it would be embedded for all of its life.

Dura's eyes locked on Farr. He was following the baby's uncertain progress through the Air, his mouth slack with wonder; but he was still firmly holding Dia's leg. 'Farr,' Dura commanded. 'Come back towards me now. Slowly, steadily - that's it ...'

Dia's only danger now was that her hinged bones would not settle neatly back into place without dislocation; and even if all went well, for a few days she would be barely able to move as the halves of her pelvis knitted together once more. With Dura and Farr guiding them, her legs closed smoothly; Dura could see the bones around Dia's pelvis sliding smoothly back into place.

Mur had managed to snatch a rag, a remnant of some piece of clothing, from the littered Air; now he wiped tenderly at Dia's relaxing, half-sleeping

face. Dura took some of the rag and mopped at Dia's thighs and belly.

Farr Waved slowly towards them. He had chased after and caught the baby, Dura saw; now he held the child against his chest as proudly as if it were his own, uncaring of the birth fluid which pooled on his chest. The infant's mouth was still distorted into the characteristic horn-shape it had needed to lock on to the womb-wall nipples which sustained it before its birth; and its tiny penis had popped out of the protective cache between its legs.

Farr, grinning, held the baby out to its mother. 'It's a boy,' he said.

'Jai,' Dia whispered. 'He's Jai.'

Forty Human Beings had survived, of fifty. All but six adult Air-pigs, four of them male, were gone. The Net, torn and scattered, was irreparable.

Logue was lost.

The tribe huddled together in the Magfield, surrounded by featureless Air. Mur and Dia clung together, cradling their new, mewling baby. Dura uncomfortably led the Human Beings through a brief service of prayers, calling down the beneficence of the Xeelee. Adda stayed close to her, silent and strong despite his age, and Farr's hand was a constant presence in hers.

Then the bodies they'd managed to retrieve were released into the Air; they slid, dwindling, down to the Quantum Sea.

Philas, wife of the dead Esk, approached Dura after the service, Waving stiffly. The two women studied each other, not speaking; Adda and the rest moved away, averting their faces.

Philas was a thin, tired-looking woman; her uneven hair was tied back with a piece of rope, making her face look skeletal. She stared at Dura, as if daring her to grieve.

The Human Beings were monogamous ... but there were more adult women than men. *So monogamy doesn't make sense*, Dura thought wearily, *and yet we practise it anyway. Or rather, we pay lip-service to it.*

Esk had loved them both ... at any rate, he had shown tenderness to them both. And his relationship with Dura had been no secret to Philas, or to anyone else, for that matter. It had certainly done Philas no harm.

Perhaps Philas and Dura could help each other now, Dura thought. Perhaps hold each other. But they wouldn't even speak about it.

And she, Dura, would not even be allowed to grieve openly.

At last Philas spoke. ‘What are we going to do, Dura? Should we rebuild the Net? What should we do?’

Staring into the woman’s dull eyecups, Dura wanted to retreat into herself, to bring forward her own grief for her father, for Esk, as a shield against Philas’s demands. *I don’t know. I don’t know. How could I know?*

But there was nowhere to retreat.

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2

Ten Human Beings - Dura with Farr in tow, Adda, the newly widowed Philas, and six other adults - climbed out of the site of the devastated encampment. They Waved steadily across the Magfield and towards the Crust, in search of food.

Adda, as was his custom, stayed a small distance away from the rest as they Waved across the field-lines. One of his eyes was matted over with the scars of age - thinking about it now he gave that cup a quick poke with a fingertip to dislodge some of the less welcome little creatures who were continually trying to establish residence in there - but the other eye was as keen as it had ever been, and as he Waved he swept his gaze through the Air above, below and all around them. He liked to stay apart to keep an eye on things ... and it allowed him to hide the fact that he sometimes had trouble keeping up with the rest. It was his boast that he could still Wave as good as any damn kid. It wasn't true, of course, but it *was* his boast. He used to wriggle across the Magfield like an Air-piglet with a neutrino fount up its arse, he recalled wistfully, but that was a long time ago. Now he must look like a Xeelee's grandmother. Adda's vertebrae seemed to be seizing up one by damn one as time wore away, so that his Waving was more like thrashing; it took a conscious effort to thrust his pelvis back, to let his legs flop behind the motion of his hips, to let his head drive ahead of the bending of his spine. And his skin was coarsened by age, too, tough as old tree-bark in places; that had its advantages, but it meant that he had trouble feeling the places where the electric currents induced in his epidermis by his motion across the Magfield were strongest. Damn it, he could barely *feel* the Magfield now; he was, he thought sourly, Waving from memory.

Much like sex these days.

As always he carried his battered and trusted spear, a sharpened pole of wood prised from a tree trunk by his own father hundreds of months ago. His fingers nestled comfortably in the gripping grooves carved expertly in the shaft, and electrical currents Magfield-induced in the wood tingled in his palm. As his father had taught him, he kept the spear pointed along the direction of the Magfield across which they climbed ... for, of course, the wood - in fact any material - was stronger in the direction of the Magfield than across it. And as any child knew, if danger did approach it would most

likely come along the Magfield lines, in which direction motion was invisibly easy.

There weren’t many predators who would attack humans, but Adda had seen a few, and his father had told him of worse. The rays, for instance ... Even a mature Air-boar - the tougher cousin of the Air-pig - could give a man or woman a hard fight, and could carry away a child as easy as snipping krypton grass away from the Crust, if it was hungry enough.

Even half as hungry as the Human Beings were going to grow before much longer.

He looked along the gleaming cage of vortex lines which swept to red-mist infinity at the South Pole, slicing up the sky around his companions. As always - whenever he travelled even a short distance from the illusory completeness of the tribe’s tiny human environ - he was struck by the immensity of the Mantle-world; and as his eye followed the converging parallels of the vortex lines he felt as if his tiny spirit, helpless with awe, was somehow drawn along the lines. The island of scattered debris which marked the site of their devastated encampment was a dirt-coloured mote Air-marooned in the clean, yellow-white immensities of the Star. And his companions - nine of them still, he counted automatically - were Waving across the field lines with unconscious synchronization, ropes and nets wrapped loosely around their waists, their faces upturned to the Crust. One man had peeled away from the rest; he had found an abandoned spin-spider web slung across the vortex lines, and was searching it efficiently for eggs.

Human Beings looked so beautiful when they moved. And when a shoal of the kids went whirling along the Magfield - flapping their legs so hard you could see the glow of the induced fields shining in their limbs, and spiralling around the flux lines fast enough to turn them into blurs - well, it was hard to imagine a better sight in this or any of the fabled, lost worlds of the Ur-humans.

But at the same time humans looked so fragile, dwarfed as they were by the immensities of the vortex-line cage and by the deep and deadly mysteries of the Quantum Sea far below. Somehow an Air-pig looked the part for this environment, he thought. Round and fat and solid ... Why, even a neutrino fount didn’t have to be the end for an Air-pig; all it had to do was to tuck in its eyes, fold down its fins and ride out the storm. Unless it got blasted out of the Star altogether, what could happen? When the fount was

done the pig could just unfold, graze on whatever foliage it could find - for trees were trees, whichever part of the Crust they were growing out of - and mate with the first Air-pig it came across. Or get mated with, Adda thought with a grin.

Humans weren't like that. Humans were *delicate*. Easily smashed up, broken apart. He thought of Esk: a damn fool, but nobody deserved to die like that. And, more than anything else, humans were *strange*. If Adda were to pluck one of these irritating little nibblers out of his dud eye now and look at it up close, he knew he'd find the same basic design as the average Air-pig: six fins, symmetrically placed, an intake-mouth to the front, jet vents to the rear, six tiny eyes. All Mantle animals were the same, just scaled big and small, or with differences of proportion; the basic features could be recognized even in superficially different creatures like rays.

... Except for humans. There was nothing, no other animal, like a human in all this world.

That wasn't a surprise, of course. Every kid learned at his mother's breast how the Ur-humans had come from somewhere far away - a place much better than this, of course; Adda suspected every human on every world grew up believing that - and had left children here to grow, to be strong, and to join the community of mankind one day, all under the beneficial and all-too-abstract gaze of that multiple God, the Xeelee.

So the Human Beings had been *put* there. Adda had no doubt about the basic truth of the old story - damn it, you only had to watch humans in flight to see the blinding self-evidence of it - but on the other hand, he thought as he watched the flock of Human Beings soar across the sky, he wouldn't really *want* to be built like an Air-pig. Fat and round and flying by farts?

Mind you, flatulence was one skill he *had* bettered as he had got older. Maybe it wouldn't have been such a bad idea to have been an Air-pig after all.

Adda was the oldest surviving Human Being. He knew what the others thought of him: that he was a sour old fool, too gloomy for his own good. But he didn't care much about that. He hadn't survived longer than any of his contemporaries by accident. But he was, and always had been, essentially a simple man, not gifted with the power over people and language shown by, say, a Logue. Or even a Dura, he thought, even though

she mightn’t realize it yet. So if he irritated folk with anecdotes of his boyhood ... but, even as they laughed at him, if they soaked up any one of the small lessons which had kept him alive ... well, that was all right by Adda.

Of course, there were fragments from the past he didn’t share with anyone. He’d no doubt, for instance, that the Glitches were changing.

There had always been Glitches, spin storms. He even knew what caused them, in an abstract sort of way: the slowing of the Star’s rotation, and the consequent explosive equalizations of spin energy. But over the last few years the Glitches had got worse ... far worse, and much more frequent.

Something else was causing Glitches now. Something unknowably powerful, disrupting the Star ...

Of course, his crotchety exterior had a major advantage - one he’d never admitted to anyone else, and only half-allowed to himself. By acting so sour he never had to show the unbearable love he felt for his fellow humans as he watched their alien, vulnerable, impossibly beautiful flight across the Magfield, or the heartbreak he endured at the loss of even the most wasted, most spoiled life.

Hefting his dragging spear in tiring fingers, Adda kicked on towards the treetops of the Crust with renewed vigour.

Farr hovered in the Air, his knees tucked against his chest. With four or five brisk pushes he emptied his bowels. He watched the pale, odourless pellets of shit sail sparkling into the empty Air and sink towards the underMantle. Dense with neutrons, the waste would merge into the unbreathable underMantle and, perhaps, sink at last into the Quantum Sea.

He’d never been so high.

The treetops were only a few minutes’ Waving above him now: only a score of mansheights or so. The round, bronzed leaves of the trees, all turned towards the Quantum Sea, formed a glimmering ceiling over the world. As he Waved he stared up at that ceiling longingly, as if the leaves somehow represented safety - and yet he looked nervously too. For beyond the leaves were the tree trunks, suspended in darkness; and beyond the trunks lay the Crust itself, where all manner of creatures prowled ... At least according to old Adda, and some of the other kids.

But still, Farr realized, he’d rather be up there amidst the trees than - *suspended* - out here.

He pushed at the Magfield and shimmered upwards.

Farr, young as he was, was used to the feeling of fear. Of mortal terror, even. But he was experiencing a kind of fear new to him - a novelty - and he probed at it, trying to understand.

The nine adults around him Waved steadily upwards, their faces turned up to the trees like inverted leaves. Their bodies moved efficiently and with varying degrees of grace, and Farr could smell the musky photons they exuded, hear the steady rhythm of their breathing as they worked, wordless. His own breath was rapid; the Air up here felt thin, shallow. And he was growing colder, despite the hard work of Waving.

Somehow, without realizing it, Farr had gotten himself to the centre of the Waving group, so they formed a protective barrier around him. In fact, he realized, he was Waving close to his sister, Dura, as if he were some little kid who needed his hand holding.

How embarrassing.

Discreetly, without making it too obvious, he leaned forward so that he slid out towards the edge of the group, away from Dura. And at the edge that strange new flavour of fear - a feeling of exposure - assailed him again. Shaking his head as if to clear out musty Air, he forced himself to turn away from the group, twisting in the Air, so that he faced outwards, across the Mantle.

Farr knew that the Mantle was tens of millions of mansheights deep. But humans could survive only in a band about two million mansheights thick. Farr knew why ... or some of it anyway. The complex compounds of heavy tin nuclei which composed his body (so his father had explained earnestly) could remain stable - remain bonded by exchanges of neutron pairs - only within this layer. It was all to do with neutron density: too far up and there weren’t enough neutrons to allow the complex bonding between nuclei; too far down, in the cloying underMantle, there were *too many* neutrons - in the underMantle the very nuclei which composed his body would begin to dissolve, liquefying at last into smooth neutron liquid.

And here - close to the treetops, nearing the top of the habitable band - he was tens of thousands of mansheights above the site of the ruined Net.

Farr looked down, beyond his Waving feet, back the way he had climbed. The vortex lines crossed the enormous sky, hundreds of them in a rigid parallel array of blue-white streaks which melted into misty vanishing-

points to left and right. The lines blurred below him, the distance between them foreshortening until the lines melted into a textured blue haze above the Quantum Sea. The Sea itself was a purple bruise below the vortex lines, its surface mist-shrouded and deadly.

... And the surface of the Sea curved downwards.

Farr had to suppress a yell by gulping, hard. He looked again at the Sea and saw how it fell subtly away in every direction; there seemed no doubt that he was looking down at a huge sphere. Even the vortex lines dipped slightly as they arced away, converging, towards the horizons of the Sea. It was as if they were a cage which encased the Sea.

Farr had grown up knowing that the world - the Star - was a multilayered ball, a *neutron star*. The Crust was the outer surface of the ball, with the Quantum Sea forming an impenetrable centre; the Mantle, including the levels inhabited by humans, was a layer inside the ball filled with Air. But it was one thing to know such a fact; it was quite another to *see* it with your own eyes.

He was *high*. And he *felt* it. He stared down now, deep down, past his feet, at the emptiness which separated him from the Sea. Of course, the Net was long since lost in the Air, a distant speck. But even that, had he been able to see it, would have been a comforting break in this looming immensity ...

A break from what?

Suddenly he felt as if his stomach were turning into a mass of Air, and the Magfield he was climbing seemed - not just invisible - but intangible, almost irrelevant. It was as if there was nothing keeping him up ...

He shut his eyes, tight, and tried to retreat into another world, into the fantasies of his childhood. Perhaps once more he could be a warrior in the Core Wars, the epic battles with the Colonists at the dawn of time. Once humans had been strong, powerful, with magical four-walled ‘wormhole Interfaces’ which let them cross thousands of mansheights in a bound, and great machines which allowed them to fly through the Star and beyond.

But the Colonists, the mysterious denizens of the heart of the Star, had emerged from their glutinous realm to wage war on humanity. They had destroyed, or carried off, the marvellous Interfaces and all the rest - and would have scraped mankind out of the Mantle altogether if not for the wily cunning of Farr: Farr the Ur-human, the giant god-warrior ...

At length he felt a touch on his shoulder; he opened his eyes to see - not a Colonist - but Dura hovering before him, a look of careful neutrality on her face. She pointed upward. ‘We’re there.’

Farr looked up.

Leaves - six of them arranged in a neat, symmetrical pattern - hung down just above his head. With a surge of absurd gratitude Farr pulled himself up into the darkness beyond the leaves.

A branch about the thickness of his waist and coated with slick-dark wood led from the leaf into a misty, blue-glowing darkness above him ... no, he thought, that was the wrong way round; somewhere up there was the trunk of the tree, suspended from the Crust, and from it grew this branch, and from that in turn grew the leaves which faced the Sea. He ran a hand along the wood of the branch; it was hard and smooth, but surprisingly warm to the touch. A few twigs dangled from the main stem, and tiny leaves sought chinks of light between their larger cousins.

He found himself clinging to the branch, his arms wrapped around it as if around the arm of his mother. The warmth of the wood seeped through his chilled body. Embarrassment flickered through his mind briefly, but he ignored it; at last he felt safe.

Dura slid through the leaves and came to rest close to him. The subdued shadow-light of the tree picked out the curves of her face. She smiled at him, looking self-conscious. ‘Don’t worry about it,’ she said, quietly enough that the others couldn’t hear. ‘I know how you feel. I was the same, the first time I came up here.’

Farr frowned. Reluctantly he released the branch and pushed himself away. ‘You were? But I feel as if - as if I’m about to be pulled out of this tree ...’

‘It’s called being frightened of falling.’

‘But that’s ridiculous. Isn’t it?’ To Farr, ‘falling’ meant losing your grip on the Magfield when Waving. It was always over in a few mansheights at the most - the tiny resistance of the Air and the currents induced in your skin soon slowed you down. Nothing to fear. And then you could just Wave your way around the Magfield to where you wanted to get to.

Dura grinned. ‘It’s a feeling as if ...’ She hesitated. ‘ ... as if you could let go of this tree, right now, and not be able to stop yourself sliding down,

across the Magfield and across the vortex lines, faster and faster, all the way to the Sea. And your belly clenches up at the prospect.'

'That's exactly it,' he said, wondering at how precise her description was. 'What does it mean? Why should we feel like that?'

She shrugged, plucking at a leaf. The heavy plate of flesh came free of its attaching branch with a sucking sound. 'I don't know. Logue used to say it's something deep inside us. An instinct we carried with us, when humans were brought to this Star.'

Farr thought about that. 'Something to do with the Xeelee.'

'Perhaps. Or something even older. In any event, it's not something you need to worry about. Here.' She held out the leaf towards him.

He took it from her cautiously. It was a bronze-gold plate, streaked radially with purple and blue, about as wide as a man's hand. It was thick and pulpy - springy between his fingers - and, like the wood, was warm to the touch, although, away from its parent branch, it seemed to be cooling rapidly. He turned it over, prodding it with a fingertip; its underside was dry, almost black. He looked up at Dura. 'Thanks,' he said. 'What shall I do with it?'

She laughed. 'Try eating it.'

After a cautious inspection of her face to make sure this wasn't some kind of joke - Dura didn't usually play tricks on him; she was a little too serious for that ... but you never knew - Farr lifted the leaf to his lips and bit into it. The flesh of the leaf was thin, surprisingly insubstantial, and it seemed to melt against his tongue; but the taste it delivered was astonishingly sweet, like the meat of the youngest Air-piglet, and Farr found himself cramming his mouth.

Within seconds he was swallowing the last of the leaf, savouring the lingering flavour on his tongue. It had been delicious but really quite light, and had done little but whet his hunger further. He looked around avidly. Here on the upper side of the treetop ceiling he could see the leaves turned downwards towards the Quantum Sea, like a layer of broad, flattened child-faces. Farr reached down to pluck another leaf.

Dura, laughing, restrained him. 'Take it easy. Don't strip the whole damn tree.'

Around a full mouth Farr said, 'It's delicious '

She nodded. ‘I know. But it won’t fill your belly. Not unless you really do strip the tree ... That’s why we have to hunt the Air-pigs, who eat the leaves - and the grass - for us.’ She pursed her lips. Then, in a tone suddenly and, to Farr, shockingly similar to their lost father’s, she said, ‘Let’s have a little lesson. Why do you think the leaves are so tasty?’

Farr thought about that. ‘Because they’re full of protons.’

Dura nodded seriously. ‘Near enough. Actually they are laced with proton-rich isotopes - of krypton, strontium, zirconium, molybdenum ... even a little heavy iron. Each nucleus of krypton, for instance, has a hundred and eighteen protons, while the tin nuclei of our bodies have just fifty each. And our bodies need protons for their fuel.’ The heavy nuclei fissioned in human stomachs. Protons combined with neutrons from the Air to make more tin nuclei - tin was the most stable nucleus in the Air - and gave off energy in the process. ‘Now. Where does the proton-rich material come from?’

‘From the Crust.’ He smiled. ‘Everyone knows that.’

The Crust, no more substantial than Air, was a gossamer solid. Its outermost layer was composed of iron nuclei. Further in, steepening pressures drove neutrons into the nuclei of the solid, forming increasingly heavy isotopes ... until the nuclei became so soft that their proton distributions began to overlap, and the neutrons dripped out to form the Air, a superfluid of neutrons.

‘All right,’ said Dura. ‘So how do the isotopes get all the way from the Crust to these leaves?’

‘That’s easy,’ Farr said, reaching to pluck another succulent leaf. ‘The tree pulls them down, inside its trunk.’

‘Using veins filled with Air. Right.’

Farr frowned, feeling his cheeks bulge around the leaf. ‘But why? What’s in it for the tree?’

Dura’s mouth opened and closed, and then she smiled, her eyes half-closed. ‘That’s a good question,’ she said. ‘One I wouldn’t have thought of at your age ... The isotopes make the leaves more opaque to the neutrinos shining out of the Quantum Sea.’

Farr nodded, chewing.

A flood of neutrinos, intangible and invisible, shone continually from the Sea - or perhaps from the mysterious Core deep beneath the Sea itself -

and sleeted through the vortex lines, through the bodies of Farr and the other humans as if they were ghosts, and through the Crust to space. The trees turned slightly neutrino-opaque leaves to that unseen light, absorbing its energy and turning it into more leaves, branches, trunk. Farr pictured trees all over the interior of the Crust, straining towards the Sealight with their leaves of krypton, strontium and molybdenum.

Dura watched him eat for a moment; then, hesitantly, she reached out to ruffle his hair-tubes. ‘I’ll tell you a secret,’ she said.

‘What?’

‘I’m glad you’re here.’

Briefly he considered pushing her hand away, of saying something funny, or cruel, to break up the embarrassing moment. But something made him hold back. He studied her face. It was a strong face, he supposed, square and symmetrical, with small, piercing eyes and shining yellow nostrils. Not beautiful, but with something of the strength of their father; and now with the first lines of age it was acquiring a bit more depth.

But there was uncertainty in that face. Loneliness. Indecision, a need for comfort.

Farr thought about it. He felt safe with Dura. Not as safe as when Logue was alive ... But, he thought ruefully, as safe as he would ever feel again. Dura wasn’t really all that strong, but she did her best.

And this moment, as the others moved away from them, being together and talking quietly and tasting the leaves, seemed to be important to her. So he said, gruffly: ‘Yes. Me too.’

She smiled at him, then bent to pluck a leaf for herself.

Adda slid silently through the treetops, following the circumference of a rough circle twenty mansheights wide. Then he moved a little further up into the suspended forest, working parallel to the lines of the trunks. The trees grew along the Magfield flux lines, and he kept his spear pointing along the Magfield as he worked his way along the smooth bark.

Save for the low, tinkling rustle of the leaves, the subdued talk of his companions, he found only silence.

He pulled himself back along the length of the tree trunk to the inverted canopy of leaves. None of the Human Beings - except, maybe, Logue’s boy Farr, who was looking a little lost - had even noticed he’d been absent.

Adda relaxed a little, munching on the thin, deceptively tasty meat of a leaf. But he kept his good eye wide open.

The Human Beings were bunched together around one trunk, nibbling leaves desultorily and clinging, one-handed, to branchlets. They were huddled together for warmth. Here, where the Air was attenuated by height, it was cold and hard to breathe: so hard, in fact, that Adda felt his reflexes - his very thinking - slowing down, turning sluggish. And it wasn't as if he had a lot of margin in that area, he reflected. It was as if the very Air which drove his bones was turning to a thin, sour soup.

The boy Farr was crouched against a section of bark a mansheight or so from everyone else. He looked as if he were suffering a bit: visibly shivering, his chest rising and falling rapidly in the attenuated Air, his hands pushing leaves into his downturned mouth with an urgency that looked more like a craving for comfort than for food.

Adda, with a single flip of his legs, Waved briskly over to the boy; he leaned towards Farr and winked with his good eye. 'How are you doing?'

The boy looked up at him, lethargic despite the shivering, and his voice, when he spoke, was deepened by the cold. 'I can't seem to get warm.'

Adda sniffed. 'That's the way it is, up here. The Air's too thin for us, see. And if you go higher, towards the Crust, it gets thinner still. But there's no need to be cold.'

Farr frowned. 'What do you mean?'

For answer Adda grinned. He raised his spear of hardened wood and aligned it parallel to the tree trunk, along the direction of the Magfield flux lines. He hefted it for a few seconds, feeling its springy tension. Then he said, 'Watch and remember.'

The boy, eyeing the quivering spear with wide eyes, scrambled back out of the way.

Adda braced himself against the Magfield. With a single movement - he remained lithe in spite of everything, Adda congratulated himself - Adda thrust the spearpoint deep into the bulk of the tree. The first stab took the spearpoint through the bark and perhaps a hand's length into the wood. By working the haft of the spear, twisting it in his hands, Adda was able to drive the spear further into the flesh of the branch, to perhaps half an arm's length.

That done, feeling his chest drag at the thin Air, Adda turned to make sure Farr was still watching. ‘Now,’ he rasped. ‘Now comes the magic.’

He twisted in the Air and placed his feet against the branch, close to the line of his half-buried spear. Then he bent and wrapped both hands around the protruding shaft of the spear, squatted so that his legs were bent and his back was straight, and heaved upwards, using the spear as a lever to prise open the wood of the branch.

... Actually it was a long time since he’d done this, he realized a few heartbeats after starting. His palms grew slick with superfluid sweat, a steady ache spread along his back, and for some reason the vision of his good eye was starting to tremble and blur. And, though the spear bowed upwards a bit as he strained, the branch did little more than groan coldly.

He let go of the spear and wiped his palms against his thighs, feeling the breath rattle in his chest. He carefully avoided eye contact with the boy.

Then he bent to the spear again.

This time, at last, the branch gave way; a plate of it the size of his chest yielded and lifted up like a lid. Adda felt his aching legs spring straight, and he tumbled away from the branch. Quickly recovering his dignity, he twisted in the Air, ignoring the protests from his back and legs, and Waved back to Farr and the opened branch. He looked down at his handiwork appraisingly and nodded. ‘Not as difficult as it looks,’ he growled at the boy. ‘Used to do that one-handed ... But trees have got tougher since I was your age. Maybe something to do with this damn spin weather.’

But Farr wasn’t listening; he crept forward to the wound in the branch and stared into it with fascination. Close to the rim of the ripped bark the wood was a pale yellow, the material looking much like that of the spear Adda had used. But further in, deeper than a hand’s length, the wood was glowing green and emitting a warmth which - even from half a mansheight away - Adda could feel as a comforting, tangible presence against his chest. The glow of the wood sparkled against Farr’s face and evoked verdant shadows within his round eyes.

Dura, Logue’s ungainly daughter, joined them now; she shot a brief smile of thanks to Adda as she crouched beside her brother and raised her palms to the warmth of the wood. The green fire scattered highlights from her limbs and face which made her look, Adda thought charitably, half-

attractive for once. As long as she didn't move about too much and reveal her total lack of grace, anyway.

Dura said to Farr, 'Another lesson. What's making the wood burn?'

He smiled at her, eyecups full of wood-glow. 'Heavy stuff from the Crust?'

'Yes.' She leaned towards Farr so that the heads of brother and sister were side by side over the glowing wood, their faces shining like two leaves. Dura went on, 'Proton-rich nuclei on their way to the leaves. The tree branch is like a casing, you see, enclosing a tube where the pressure is lower than the Air. But when the casing is breached the heavy nuclei inside fission, decaying rapidly. What you're seeing is nuclei burning into the Air ...'

Adda saw how Farr's smooth young face creased with concentration as he absorbed this new bit of useless knowledge.

Useless?

Well, maybe, he thought; but these precious, abstract facts, polished by retelling and handed down from the earliest days of the Human Beings - from the time of their expulsion from Parz City, ten generations ago - were treasures. Part of what made them human.

So Adda nodded approvingly at Dura and her attempts to educate her brother. The Human Beings had been thrust into this upflux wilderness against their will. But they were not savages, or animals; they had remained civilized people. Why, some of them could even read; a handful of books scraped painfully onto scrolls of pigskin with styli of wood were among the Human Beings' principal treasures ...

He leaned towards Dura and said quietly, 'You'll have to go on, you know. Deeper into the forest, towards the Crust.'

Dura started. She pulled away from the trunk-wound, the light of the burning nuclei shining from the long muscles of her neck. The other Human Beings, a few mansheights away, were still clustered about the treetops; most of them, having crammed their bellies full, were gathering armfuls of the succulent leaves. She said, 'I know. But most of them want to go back to the camp already, with their leaves.'

Adda sniffed. 'Then they're damn fools, and it's a shame the spin weather didn't take them instead of a few with more sense. Leaves taste good but they don't fill a belly.'

‘No. I know.’ She sighed and rubbed the bridge of her nose, ran a finger around the rim of one eyecup absently. ‘And we have to replace the Air-pigs we lost in the spin storm.’

‘Which means going on,’ Adda said.

She said with a weary irritation, ‘You don’t need to tell me, Adda.’

‘You’ll have to lead them. They won’t go by themselves; folk aren’t like that. They’re like Air-pigs: all wanting to follow the leader but none wanting to lead.’

‘They won’t follow me. I’m not my father.’

Adda shrugged. ‘They won’t follow anyone else.’ He studied her square face, seeing the doubts and submerged strength in its thin lines. ‘I don’t think you really have a choice.’

‘No,’ she sighed, straightening up. ‘I know.’ She went to talk to the tribesfolk.

When she returned to the nuclear fire, only Philas, the widow of Esk, came with her. The two women Waved side by side. Dura’s face was averted, apparently riven with embarrassment; Philas’s expression was empty.

Adda wasn’t really surprised at the reaction of the rest. Even when it was against their own damn interest, they’d snub Logue’s daughter.

He was interested to see Philas with Dura, though. Everyone had known about Dura’s relationship with Esk; it was hardly the sort of thing that could be kept quiet in a community reduced to fifty people, counting the kids.

It had been against the rules. Sort of. But it was tolerated, and hardly unique - as long as Dura obeyed a few unspoken conventions. Such as restricting her reaction to Esk’s death, keeping herself away from the widowed Philas.

Just another bit of stupidity, Adda thought. The Human Beings had once numbered hundreds - even in the days of Adda’s grandfather there had been over a hundred adults - and maybe then conventions about adultery might have made sense. But not now.

He shook his head. Adda had despaired of Human Beings long before Farr was born.

‘They want to go back,’ said Dura, her voice flat. ‘But I’ll go on. Philas will come.’

The woman Philas, her face drab and empty, her hair lying limply against her angular skull, looked to Adda as if she had nothing left to lose anyway. Well, he thought, if it helped the two women work out their own relationship, then fine.

Some hunting expedition it was going to be, though.

He lifted his spear.

Dura frowned. ‘No,’ she said. ‘I can’t ask you to ...’

Adda growled a soft warning to shut her up.

Farr straightened up from the burning pit. ‘I’ll come too,’ he said brightly, his face turned up to Dura.

Dura placed her hands on his shoulders. ‘Now, that’s ridiculous,’ she said in a parent’s tones. ‘You know you’re too young to ...’

Farr responded with bleated protests, but Adda cut across him impatiently. ‘Let the boy come,’ he rasped to Dura. ‘You think he’d be safer with those leafgatherers? Or back at the place where the Net used to be?’

Dura’s anxious face swivelled from Adda to her brother and back again. At length she sighed, smoothing back her hair. ‘All right. Let’s go.’

They gathered their simple equipment. Dura knotted a length of rope around her waist and tucked a short stabbing-knife and cleaning brush into the rope, behind her back; she tied a small bag of food to the rope.

Then, without another word to the others, the four of them - Adda, Dura, Farr and the widow Philas - began the slow, careful climb towards the darkness of the Crust.

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3

They moved in silence.

At first Dura found the motion easy. The tree slid beneath her, almost featureless, slowly widening as she climbed up its length. The tree trunk grew along the direction of the Magfield, and so moving along it meant moving in the easiest direction, parallel to the Magfield, with the superfluid Air offering hardly any resistance. It was barely necessary to Wave; Dura found it was enough to push at the smooth, warm bark with her hands.

She looked back. The leafy treetops seemed to be merging into a floor across the world now, and the open Air beyond was being sealed away from her. Her companions were threaded along the trunk behind her, moving easily: the widow Philas apparently indifferent to her surroundings, Farr with his eyecups wide and staring, his mouth wide open and his chest straining at the thin Air, and dear old Adda at the back, his spear clasped before him, his good eye constantly sweeping the complex darkness around them. The three of them - naked, sleek, with their ropes, nets and small bags bound to them - looked like small, timid animals as they moved through the shades of the forest.

They rested. Dura took her cleaning scraper from her belt of rope and worked at her arms and legs, dislodging fragments of leaf and bark.

Adda glided up the line to her, his face alert. ‘How are you?’

Looking at him, Dura thought of her father.

She’d been involved in hunts before, of course - as had most adult Human Beings - but always she’d been able to rely on the tactical awareness, the deep, ingrained knowledge of the Star and all its ways, of Logue and the others.

She’d never *led* before.

Some of her doubt must have shown in her face. Adda nodded, his wizened face neutral. ‘You’ll do.’

She snorted. Keeping her voice low enough that only Adda could hear, she said, ‘Maybe. But what good is it? Look at us ...’ She waved a hand at the little party. ‘A boy. Two women, distracted by grief ...’

‘And me,’ Adda said quietly.

‘Yes,’ she acknowledged. ‘Thanks for staying with me, Adda. But even if by some miracle this collection of novices succeeds we’ll return with only

two, maybe three Air-pigs. We wouldn't have the capacity to restrain any more.' She remembered - in the better days of her childhood - hunting parties of ten or a dozen strong and alert men and women, returning in triumph to the Net with whole herds of wild pigs. 'And what good will that do? The Human Beings are going to starve, Adda.'

'Maybe. But it may not be as bad as that. We might find a couple of sows, maybe with piglets ... enough to reestablish our stock. Who knows? And look, Dura, you can only lead those who wish to be led. Don't flog yourself too hard. Even Logue only led by consent. And remember, Logue never faced times as hard as what's to come now.

'Listen to me. When the people get hungry enough, they'll turn to you. They'll be angry, disillusioned, and they'll blame you because there's no one else to blame. But they'll be yours to lead.'

She found herself shuddering. 'I've no choice, have I? All my life, since the moment of my birth, has had a kind of logic which has led me to this point. And I've never had a choice about any of it.'

Adda smiled, his face a grim mask. 'No,' he said harshly. 'But then, what choices do any of us have?'

The forest seemed empty of Air-pigs.

The little party grew fretful and tired. After another half-day's fruitless searching, Dura allowed them to rest, to sleep.

When they woke, she knew she would have to lead them downflux. Downflux, and higher - deeper into the forest, towards the Crust.

Towards the South - downflux - the Air was richer, the Magfield stronger. The pigs must have fled that way, following the Glitch. But everyone knew downflux was a dangerous direction to travel.

The Human Beings followed her with varying degrees of enthusiasm.

The forest was dense, complex. Six-legged Crust-crabs scuttled from Dura as she approached, abandoning webs slung between the tree trunks. Cocoons of leeches and other unidentifiable creatures clustered thick on the trunks, like pale, bloated leaves.

A ray turned its blind face towards her.

Adda hissed a warning. Dura flattened herself against the tree trunk before her, wrapping her arms around it and willing her ragged breath to still. The wood pressing against her belly and thighs was hard and hot.

A breath of Air at her back, a faint shadow.

She shifted her head to the right, feeling the roughness of the bark scratch her cheek. Her eyecups swivelled, following the ray as it glided by, utterly silent. The ray was a translucent sheet at least a mansheight wide. At its closest it was no more than an arm's length from her. She could recognize the basic architecture of all the Mantle's animals: the ray was built around a thin, cylindrical spine, and six tiny, spherical eyes ringed the babyish maw set into the centre of its face. But the fins of the ray had been extended into six wide, thin sheets. The wings were spaced evenly around the body and they rippled as the ray moved; electron gas sparkled around the leading edges. The flesh was almost transparent, so that it was difficult even to see the wings, and Dura could see shadowy fragments of some meal passing along the ray's cylindrical gut.

The ray was the only animal - other than humans - that moved by Waving, rather than by squirting jetfarts like pigs or boar. Moving in silence, without the sweet stink of jetfarts, the ray was an effective predator. And its mouth, though tiny, was ringed by jagged, ripping teeth.

The ray slid over the four humans for several heartbeats, apparently unaware of their presence. Then, still silent, it floated away into the shadows of the forest.

Dura counted to a hundred before pushing herself away from the tree trunk.

The vortex lines were dense here, almost tangled together among the trees. The Star, its rotation continually slowing, gradually expelled the vortex lines from the Mantle ... until a fresh Glitch struck, when the lines crumbled into deadly fragments before renewing.

The Air was noticeably thinner. Dura felt her chest strain at the stuff and her heart pumped as it sought to power her muscles; from various points in her body she heard the small pops of pressure equalizing. She knew what was happening, of course. The Air had two main components, a neutron superfluid and an electron gas. The neutrons were thinning out; more pressure here was supplied by the gas of free electrons. When she held up her hand before her face she could see the ghostly sparkle of electrons around her fingers, bright in the gloom and evoking dim highlights from the crowding leaves.

But now her vision seemed to be failing. The Air was growing poor at carrying the high-frequency, high-velocity sound waves which allowed her

to see. And, worse, the Air - thin as it was - was losing its superfluidity. It started to feel sticky, viscous; and as she moved she began to feel a breeze, faint but unquestionably present, plucking at her face and hair-tubes, impeding her motion.

She found herself trembling at the thought of this sticky stuff congealing in the fine network of capillaries which powered her muscles - the network which sustained her very being.

Human Beings weren't meant to live up here. Even pigs spent no more time close to the Crust than they had to. She heaved at the sludgelike Air, feeling it curdle within her capillaries, and longed for the open space of the Mantle beneath the roof-forest, for clean, fresh, thick Air.

In all directions around her the tree trunks filled the world. As it became progressively more difficult to see, the trunks, parallel, curving slightly to follow the Magfield, seemed suddenly artificial, sinister in their regularity, like the threads of some huge Net around her. She found herself gripped by a slow panic. Her chest heaved at the unsatisfying Air, the breath noisy in her throat. It took a strong, conscious effort to keep moving, an exercise of will just to keep her hands working at the tree trunk.

She was concerned for Farr. Even in the gloom she could see how distressed he was: his face was white and seemed to be bulging, his eyes half-closed; he seemed barely aware of where he was, and he moved along the trunk stiffly.

Dura forced herself to look away, to carry on. There was no help she could give him. Not now. The best she could do was to move on, to bring home the results of a successful hunt. And as Adda had said, the boy was probably safer with her than anywhere else ...

At least Adda was close to Farr. Dura found herself offering up a simple, childlike message of thanks to the watchful Xeelee for the old man's presence and support.

When the climb ended it was with a suddenness that startled her.

The tree trunk she'd followed had broadened only gradually, at last reaching a width just too great for her to stretch her arms around. Now, suddenly, the clean lines of the trunk exploded into a complex tangle of roots which formed a semicircular platform over her head. Peering up, she could see the roots receding into the dim, translucent interior of the Crust

itself; they looked almost like human arms, reaching deep into the gossamer solid in search of neutron-rich nuclei of molybdenum, strontium or krypton.

Looking around, she saw how the root system of the tree merged with those of its neighbours in the forest, so that a carpet of wood formed an impenetrable ceiling over the forest. A few strands of purplish grass sprouted among the roots. The tree trunks, following the Magfield lines, met the root ceiling at an oblique angle.

Soon the others had joined her. The four Human Beings huddled together, clinging to loose roots for stability. It was so dim now that Dura could barely make out the faces of her companions, the outlines of their thin bodies. Philas's eyes were dull with exhaustion and apathy; Farr, trembling, had his arms wrapped around himself, and his mouth was wide as he strained at the residual Air. Adda was as uncomplaining as ever, but his face was set and pale, and Dura could see how his old shoulders were hunched over his thin, heaving chest. Adda took leaves from the bulging pack at his waist. Dura bit into the food gratefully. Insubstantial and unsatisfying as it was, the food seemed to boost what was left of her strength. Farr continued to shiver; Dura put an arm around him and drew him closer to her, hoping to transmit enough of her body warmth to stop the trembling.

Farr asked, 'Are we at the Crust?'

'No,' Adda growled. 'The true Crust is still millions of mansheights above us. But we've reached the roots; this is as far as we can go.'

Philas's voice was low and harsh in the thin Air. 'We can't stay here for long.'

'We won't need to,' Dura said. 'But maybe we should open up a trunk and start some nuclear burning again, before we congeal here. Adda, could you ...'

The old man raised a hand, curtly. 'No time,' he breathed. 'Just listen ... all of you.'

Dura frowned but said nothing. The four fell into a silence broken only by the rattle of their uneven breaths. Dura felt small, vulnerable, isolated, dwarfed by the immensities of the root systems over their heads. Every instinct ordered her to bolt, to slide back down the tree and plummet through the wall of treetops to the open Air where she belonged; and she could see the same urges in the set faces of the others.

There. A rustle, a distant grunting ... It came from the root systems, somewhere to her left.

Adda's face crumpled with frustration. 'Damn it all,' he hissed. 'I can't hear; my ears are turning to mush.'

'I can hear them, Adda,' Farr said.

Dura pointed. 'That way.'

Adda nodded, his good eye half-closed with satisfaction. 'I knew it wouldn't take long. How many?'

Dura and Philas looked at each other, each seeking the answer in the other's face. Dura said, 'I can't tell, Adda . . . more than one, I think.'

For a few seconds Adda swore steadily, cursing his age, his failing faculties. 'Well, into the Ring with it,' he said finally. 'We'll just have to chance there aren't too many in the herd.' In an urgent, harsh whisper he gave them careful instructions on how, in the event of attack by a boar, they should scatter . . . and work *across* the Magfield flux rather than try to flee along it. 'Because that's the way the boar will go. And, believe me, the boar will be a damn sight quicker than you.' His face was a murderous, chilling mask in the twilight.

Dura said, 'Philas, go with Adda and Wave around to the far side of the herd. Take the nets and rope and get downflux from them. Farr, stay with me; we'll wait until the others are in position and then we'll chase the pigs into the nets. All right?'

Hurriedly they passed round the equipment they would need. Dura took two short stabbing spears from the bundle carried by Philas. Then Adda and Philas slid silently into the darkness, working across the Magfield by Waving and by clambering across the parallel tree trunks.

Farr stayed close to Dura, still pressed close to her for warmth, trusting. For a few seconds she looked down at him - his eyes seemed vacant, as if he were not fully conscious - and she tried to imagine how she would feel if anything were to befall this boy, as a result of her own ignorance and carelessness.

Well, she thought ruefully, at least she'd done her best for him in the way she'd structured the hunt. It was undoubtedly safer to be upflux of the herd when the hunt started. And she would have been greatly more worried if she hadn't stayed with Farr herself.

With a last, brisk hug, she whispered, ‘Come on, Farr. We’ve got work to do. Let’s see how close we can get to those pigs without them spotting us.’

He nodded dully and drew away from her, still shivering.

Hefting a short spear in each hand, Dura began to pull herself across the lines of the fat trunks in the direction of the noises she’d heard. Moving in this direction, the resistance of the Magfield was added to the thickened viscosity of the Air, and the going was hard. She felt submerged and had to suppress a pang of panic at the feeling of being trapped up here, of being unable to free herself from this solidifying Air.

She did not look back, but was aware of Farr following her, perhaps a mansheight behind; he moved silently save for his rattling breath, and she could hear how he was trying to control the noise of his breathing. *The brave little hunter*, she thought. *Logue would have been proud of him.*

It took only seconds to reach the pigs; soon Dura could see the blocky forms of several animals sliding between the tree trunks, still apparently oblivious to the humans.

Beckoning Farr to come close to her, Dura lodged herself amid the tree trunks perhaps ten mansheights below the root ceiling.

There were three Air-pigs. The animals, each about the size of a man’s torso, worked steadily around the bases of the trees, scooping up purple-green krypton grass and other small plants. The pigs’ fins waved languidly as they fed, and Dura could see how their eyestalks were fixed on the grass before them and their mouths were pursed, almost shut. When grazing on the thin foodstuff which floated in the free Air, a pig’s mouth could open so wide that it exposed the entire front end of the pig, turning the animal into an open-ended tube, a crude eating machine trailing eyestalks and fins. But here in this failing Air the mouths were barely opening as they worked, lapping and chewing at the krypton grass. The pigs were keeping their squat bodies sealed up as much as possible, maintaining an inner reservoir of life-sustaining Air; in this way, she knew, the pigs could last for days up here - unlike fragile, weak and ill-adapted Human Beings.

She turned to Farr, who hovered beside her with his eyes barely protruding over the trunk. She mimed: *Just three of them. We’re in luck.*

He nodded and pointed at one of the pigs. Dura, studying the animal more closely, saw that it was bigger than the others: bulkier, clumsier.

A pregnant sow.

She felt a smile spread across her face. Perfect.

She counted one hundred heartbeats, then lifted her spears. Philas and Adda should be in position by now.

She nodded to Farr.

The two humans erupted from behind their trunk. Dura yelled as loudly as the thin Air would permit; she hurled herself along the Magfield flux at the pigs, rattling her spears against the wood of the trunk. Beside her Farr did the same, his hair tangling almost comically.

At their approach the pigs' mouths snapped shut. Their eyestalks lifted, rigid, to fix straining gazes on their sudden assailants. Then, as if with one mind, the pigs turned and bolted.

The animals hurled themselves along the Magfield lines, seeking the easiest and quickest escape. They clattered against tree trunks and bounced over roots, their jet orifices farting clouds of green-stained, sweet-smelling Air. Dura and Farr gave chase, still roaring enthusiastically. Suddenly Dura found herself bound up by the excitement of the hunt, and a new energy coursed through her.

The pigs, of course, outran Dura and Farr easily. Within a few heartbeats the animals were disappearing into the darkness of distance, trailing clouds of jetfarts ...

But there were Adda and Philas, waiting just a little further down the Magfield, with a net pulled tight between them and with stabbing spears at the ready.

The first two pigs were moving too rapidly to stop. They turned in the Air and tumbled against each other, their huge mouths popping open to emit childlike squeals, but they hurtled backside first into the net. Philas and Adda worked together, a little clumsily but effectively. Within a few heartbeats they had thrown the net around the two pigs and were prodding at them, trying to force them to subside. Green jetfarts squirted from the pigs, and the net bulged as the terrified animals strove vainly to escape. By the time Dura got there they would have the animals trussed up and then ...

There was a scream behind her. Farr's scream.

She whirled in the Air, Adda and Philas forgotten. The third pig - the pregnant sow, she saw - had evaded Adda's net. Terrified and enraged, it

had flown down, away from the root ceiling, and was now plummeting up through the trees, back along the Magfield flux ... and straight at Farr.

The boy gazed at the animal's flapping fins and rigid, staring eyestalks, apparently transfixed. *He isn't going to get out of the way,* Dura realized. And the momentum of the pig would crush him in a moment.

She tried to call out, to move towards the boy - but she was plunged into a nightmare of slow motion. The Magfield was thick, clinging, the Air a soupy mass in which she was embedded. She struggled to get free, to shout to her brother, but the hurtling, blurring speed of the pig reduced her efforts to the trivial.

There was barely a mansheight between the pig and the boy. Dura, trapped in viscous Air, heard herself scream.

Suddenly the sow opened its mouth wide and bellowed in agony. Jetfarts staining the air, it veered abruptly. One ventral fin caught Farr with a side-swipe which sent him spinning against a tree trunk ... but, Dura saw with a flood of relief, he was no more than shocked.

As the sow tumbled in the Air the reason for its distress revealed itself: Adda's long spear, protruding from the sow's belly. The spear quivered as the beast thrashed, seeking an escape from this sudden agony.

Now Adda himself raced along the Magfield, ungainly but determined. Behind him the two trapped pigs were struggling free of the abandoned net. Adda bellowed: 'She's gone rogue ... Dura, get to the boy and keep him away.'

Now the pig settled in the Air, all six of its eyestalks triangulating on the old man. Adda slowed to a hover, arms and legs outspread, his gaze locked on the pig.

Dura said uncertainly, 'Adda, get out of the way ... I think ...'

'Get the damn boy.'

Dura hurried to obey, skirting the hovering pig.

With a howl that rent the glutinous Air, the pig charged Adda.

Adda twisted in the Air and began to Wave out of the way, his legs thrashing at the Magfield ...

But, Dura saw instantly, not fast enough.

Clinging to the weeping Farr there was nothing she could do as the final, ghastly moments unfolded. Adda's face showed no fear - but no

acceptance either, Dura saw; there was only a grimace of irritation, perhaps at this newest failure of his crumbling body.

As it closed on Adda, trailing green clouds of jetfarts, the sow opened its mouth.

The huge, circular maw closed on both Adda's legs. The momentum of the hurtling sow carried away both pig and Adda, and Dura cried out as she saw Adda's fragile body smashed against a tree trunk. But he was still conscious, and fighting; with both fists he pounded on the sow's wide, quivering back.

Dura kicked away from the tree and Waved as hard as she could towards the pig. Philas was approaching the pig from the far side, her stabbing spears held out before her. The woman's eyes were wide, emptied by shock and terror.

The pig, halted by its impact with the tree, pulled back into clear Air now, and it began, with lateral squirts of gas, to rotate around its long axis. Adda seemed to realize what was happening. With his legs still trapped, he beat harder at the pig's flank, cursing violently. But still the pig twisted, ever faster, becoming at last a blur of fins and eyestalks. Jetfart gas trailed around its body in circular ribbons, and electron glow sparkled from its fins. Adda, at last, fell backwards and lay against the pig's long flank, his knees bent cruelly.

This was the way boars killed their prey, Dura knew: the boar would spin so fast that the superfluidity of the Air which sustained all animals in the Mantle, including humans, broke down. It was simple, but deadly effective. Even now, she knew, the pain of Adda's trapped legs, the agony induced by the whirling of the world around him, would be subsumed by a dull, disabling numbness as his muscles ceased to function, his senses dimmed, and at last even his mind failed.

With a yell from deep in her gut, Dura threw herself at the whirling animal. She scrabbled at its smooth, slippery hide, feeling her belly and legs brush against its hot flesh. She stabbed at its tough epidermis once, twice, before being hurled clear. She tumbled backwards through the Air, colliding with a trunk hard enough to knock the breath out of her.

One of her two short spears had snapped, she saw, and was now floating harmlessly away. But she had succeeded in ramming the other through the skin of the pig. The wounded animal, with Adda's spear still protruding

from its belly, tried to maintain its rotation; but, distracted by pain, its motion became uneven, and the pig began to precess clumsily, the axis of its rotation dipping as it thrashed in the Air. Poor Adda, now evidently unconscious, was thrown back and forth by the pig, his limp body flopping passively against the animal's flank.

Philas fell on the pig now and drove another spear into the animal's hide, widening the wound Dura had made. The animal opened its huge mouth, its circular lip-face pulling back to reveal a green-stained throat, and let out a roar of pain. Adda, his legs freed from the mouth, fell limply away from the pig; Farr hurried to him.

Philas rammed her second spear into the thrashing pig's mouth, stabbing at the organs exposed within. Dura pushed away from the tree and hurled herself once more at the sow; she was weaponless, but she hauled at the spears already embedded in the pig's flanks, wrenching open the wounds, while Philas continued to work at the mouth.

It took many minutes. The pig thrashed and tore at the Air to the end, striving to use its residual rotation to throw off its attackers. But it had no escape. At last, leaking jetfarts aimlessly, its cries dying to a murmur, the sow's struggles petered away.

The two women, exhausted, hung in the Air. The sow was an inert mass, immense, its skin ripped, its mouth gaping loosely. Dura - panting, barely able to see - found it difficult to believe that even now the animal would not erupt to a ghastly, butchered semblance of life.

Dura Waved slowly through the Air to Philas. The two women embraced, their eyes wide with shock at what they had done.

Farr gingerly laid Adda along a tree trunk, relying on the gentle pressure of the Magfield to hold him in place. He stroked the old man's yellowed hair. He had retrieved Adda's battered old spear and laid it beside him.

Dura and Philas approached, Dura wiping trembling hands on her thighs. She studied Adda's injuries cautiously, scared even to touch him.

Adda's legs, below the knees, were a mangled mess: the long bones were obviously broken in several places, the feet reduced to masses of pulped meat. The surface of Adda's chest was unbroken but oddly uneven; Dura, fearful even to touch, speculated about broken ribs. His right arm dangled at a strange angle, limp in the Air; perhaps the shoulder had been broken. Adda's face was a soft, bruised mess. Both eyecups were filled by

gummy blood, and his nostrils were dimmed ... And, of course, the Xeelee alone knew about internal injuries. Adda's penis and scrotum had fallen from their cache between his legs; exposed, they made the old man look still more vulnerable, pathetic. Tenderly, Dura cupped the shrivelled genitalia in her hand and tucked them away in their cache.

'He's dying,' Philas said, her voice uneven. She seemed to be drawing back from the battered body, as if this, for her, was too much to deal with.

Dura shook her head, forcing herself to think. 'He'll certainly die up here, in this lousy Air. We've got to get him away, back into the Mantle ...'

Philas touched her arm. She looked into Dura's face, and Dura saw how the woman was struggling to break through her own shock. Philas said, 'Dura, we have to face it. He's going to die. There's no point making plans, or struggling to get him away from here . . . all we can do is make him comfortable.'

Dura shook off the light touch of the widow, unable - yet - to accept that.

Adda's mouth was phrasing words, feebly shaping the breath that wheezed through his lips. '... Dura ...'

Still scared to touch him, she leaned close to his mouth. 'Adda? You're conscious?'

A sketch of a laugh came from him, and he turned blind eyecups to her. '... I'd ... rather not be.' He closed his mouth and tried to swallow; then he said, 'Are you all right? ... The boy?'

'Yes, Adda. He's fine. Thanks to you.'

' ... And the pigs?'

'We killed the one that attacked you. The sow. The others ...' She glanced to the nets which drifted in the Air, tangled and empty. 'They got away. What a disaster this has been.'

'No.' He stirred, as if trying to reach out to her, then fell back. 'We did our best. Now you must ... try again. Go back ...'

'Yes. But first we have to work out how to move you.' She stared at his crushed body, trying to visualize how she might address the worst of the wounds.

Again that sketchy, chilling laugh. 'Don't be so ... damned stupid,' he said. 'I'm finished. Don't ... waste your time.'

She opened her mouth, ready to argue, but a great weariness fell upon her, and she subsided. Of course Adda was right. And Philas. Of course he would soon die. But still, she knew, she would have to try to save him. ‘I never saw a pig behave like that. A boar, maybe. But ...’

‘We should have ... expected it,’ he whispered. ‘Stupid of me ... pregnant sow ... it was bound to ... react like that.’ His breath seemed to be slowing; in a strange way, she thought as she studied him, he seemed to be growing more comfortable. More peaceful.

She said softly, ‘You’re not going to die yet, damn you.’

He did not reply.

She turned to Philas. ‘Look, we’ll have to try to bind up his wounds. Cut some strips from the hide of that sow. Perhaps we can strap this damaged arm across his body. And we could tie his legs together, use his spear as a splint.’

Philas stared at her for a long moment, then went to do as Dura had ordered.

Farr asked, ‘What can I do?’

Dura looked around, abstracted. ‘Go and retrieve that net. We’re going to have to make a cradle, somehow, so we can haul him back home ...’

‘All right.’

When Philas returned, the women tried to straighten Adda’s legs in preparation for binding them to the makeshift splint. When she touched his flesh, Dura saw Adda’s face spasm, his mouth open wide in a soundless cry. Unable to proceed, she pulled her hands away from his ruined flesh and stared at Philas helplessly.

Then, behind her, Farr screamed.

Dura whirled, her hands reaching for Adda’s spear.

Farr was still working on the tangled net - or had been; now he was backing away from it, his eyecups wide with shock. With the briefest of glances, Dura assured herself that the boy had not been harmed. Then, as she hurried to his side, she looked past him to discover what was threatening him ...

She slowed to a halt in the Air, her mouth dangling, forgetting even her brother in her amazement.

A box, floating in the Air, approached them. It was a cube about a mansheight on a side made of carefully cut plates of wood. Ropes led to a

team of six young Air-pigs which was patiently hauling the box through the forest. And, through a clear panel set into the front of the box, a man's face peered out at her.

He was frowning.

The box drifted to a halt. Dura raised Adda's spear.

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4

Toba Mixxax hauled on his reins. The leather ropes sighed through the sealant membranes set in the face of the car, and he could see through the clearwood window - and feel in the rapid slackening of tension in the reins - how eagerly the team of Air-pigs accepted the break.

He stared at the four strangers.

... And how strange they were. Two women, a kid and a busted-up old man - all naked, one of the women waving a crude-looking wooden spear at him.

At first Mixxax had assumed, naturally, that these were just another set of coolies taking a break in the forest, here at the fringe of his ceiling-farm. But that couldn't be right, of course; even the dimmest of his coolies wouldn't wander so far without an Air-tank. In fact, he wondered how this little rabble was surviving so high, so badly equipped. All they had were spears, ropes, a net of what looked like untreated leather ...

Besides, he'd recognize his own coolies. Probably, anyway.

He'd been patrolling the woodland just beyond the border of the ceiling-farm when he'd come across this group - or at least, he'd meant to be patrolling; it looked as if, daydreaming, he'd wandered a little further into the upflux forest than he'd meant to. Well, that wasn't so surprising, he told himself. After all there was plenty on his mind. He was only fifty per cent through his wheat quota, with the financial year more than three-quarters gone. He found his hands straying to the Corestuff Wheel resting against his chest. Any more spin weather like the last lot and he was done for; he, with his wife Ito and son Cris, would be joining the swelling masses in the streets of Parz itself, dependent on the charity of strangers for their very survival. And there was precious little charity in the Parz of Hork IV, he reminded himself with a shudder.

With an effort he brought his focus back to the present. He stared through the car's window at the vagrants. The woman with the spear - tall, streaks of age-yellow in her hair, strong- looking, square face - stared back at him defiantly. She was naked save for a rope tied around her waist; affixed to the rope was some kind of carrying-pouch that looked as if it was made from uncured pigskin. She was slim, tough-looking, with small, compact breasts; he could see layers of muscles in her shoulders and thighs.

She was, frankly, terrifying.

Who were these people?

Now he thought about it, this far upflux from Parz they couldn't possibly be stray coolies, even runaways from another ceiling-farm. Toba's farm was right on the fringe of the wide hinterland around Parz ... just on the edge of cultivation, Toba reminded himself with an echo of old bitterness; not that it allowed him to pay less tax than anyone else. Even the farm of Qos Frenk, his nearest neighbour, was several days' travel downflux from here without a car.

No, these weren't coolies. They must be upfluxers ... *wild people.*

The first Toba had ever encountered.

Toba's left hand circled in a rapid, half-involuntary Sign of the Wheel over his chest. Maybe he should just yank on the reins and get out of here, before they had a chance to do anything ...

He chided himself for lack of courage. What could they do, after all? The only man looked old enough to be Toba's father, and it seemed to be all the poor fellow could do just to keep breathing. And even the two women and the boy working together couldn't get through the hardened wood walls of a sealed Air-car ... could they?

He frowned. Of course, they could always attack him from the outside. Kill the Air-pigs, for instance. Or just cut the reins.

He lifted the reins. Maybe it would be better to come back with help - get some of the coolies into a posse, and then ...

Fifty per cent of quota.

He dropped the reins, suddenly angry with himself. No, damn it; poor as it was, this was his patch of Crust, and he'd deserve to be Wheel-Broken if he let a gang of weaponless savages drive him away.

Full of a righteous resolve, Toba pulled the mouthpiece of the Speaker towards him and intoned into it, 'Who are you? What are you doing here?'

The upfluxers startled like frightened Air-pigs, he was gratified to see. They Waved a little further from the car and poked their short spears towards him. Even the old fellow looked up - or tried to; Toba could see how the injured man's eyecups were sightless, clouded with pus-laced, stale Air.

Toba was filled with a sudden sense of confidence, of command of the situation. He had nothing to fear; he was intimidating to these ignorant

savages. They'd probably never even *heard* of Parz City. His anger at their intrusion seemed to swell as his apprehension diminished.

Now the strong-looking woman approached the car - cautiously, he saw, and with her spear extended towards him - but evidently not paralysed by fear ... as, he conceded, he might have been were the positions reversed.

The woman shouted through the clearwood at him now, emphasizing her words with stabs of her spearpoint at his face; the voice was picked up by the Speaker system's external ear.

'Who do you think you are, a Xeelee's grandmother?'

Toba listened carefully. The voice of the upfluxer was distorted by the limitations of the Speaker, of course; but Toba was able to allow for that. He knew how the Speaker system worked, pretty well. Working a ceiling-farm as far from the Pole as Toba's - so far upflux, in such an inhospitable latitude - the car's systems kept him alive. The strongest of the coolies could survive for a long time out here and maybe some of them could even complete the trek back to the Pole, to Parz City. But not Toba Mixxax, City-born and bred; he doubted he would last a thousand heartbeats.

So he had assiduously learned how to maintain the systems of the car on which his life depended ... The Speaker system, for instance. The Air he breathed was supplied by reservoirs carved into the thick, heavy wooden walls of the car. The Speaker system was based on fine tubes which pierced the reservoirs; the tubes linked membranes set in the inner and outer walls. The tubes were filled with Air, kept warmed to perfect superfluidity by the reservoirs around them, and so capable of transmitting without loss the small temperature fluctuations which human ears registered as sound.

But the narrowness of the tubes did tend to filter out some lower frequencies. The upfluxer savage's voice sounded thin and without depth, and the resonances gave her a strange, echoing timbre. Despite that, her words had been well formed - obviously in his own language - and tainted by barely a trace of accent.

He frowned at his own surprise. Was he so startled that the woman could speak? These were upfluxers - but they were people, not animals. The woman's few words abruptly caused him to see her as an intelligent, independent being, not capable of being cowed quite so easily, perhaps, by his technological advantage.

Maybe this wouldn't be so simple after all.

‘What’s wrong?’ the woman rasped. She shook her spear at him. ‘Too scared to speak?’

‘My name is Toba Mixxax, freeman of Parz. This is my property. And I want you out of here.’

The injured old fellow swivelled sightless eyecups at Toba. He shouted - weakly, but loud enough for Toba to hear: ‘Parz bastards! Think you own the whole damn Mantle, don’t you?’ A fit of coughing interrupted the old fool, and Toba watched as the stronger woman bent over him, apparently asking him what he was talking about. The man ignored her questions, and once his coughing had subsided he called out again: ‘Bugger off, Pole man!’

Toba pursed his lips. They knew about Parz. Definitely not as ignorant as he had supposed, then. In fact, maybe *he* was the ignorant one. He bent to his Speaker membrane, trying to load his voice with threat: ‘I won’t warn you again. I want you off my property. And if you don’t I ...’

‘Oh, shut up.’ Now the strong woman thrust her face into his window; Toba couldn’t help but recoil. ‘What do you think that means to us, “your property”? And anyway ...’ She pointed at the injured old fellow. ‘We can’t go anywhere with Adda in that state.’ The old man, Adda, called something to her - perhaps an order to leave him - but she ignored him. ‘We’re not going to move. Do what you have to do. And we ...’ - she raised her spear again - ‘will do whatever we can to stop you.’

Toba stared into the woman’s clear eyecups.

At his side was a collection of small, finely carved wooden levers. Maybe now was the time to pull on those levers, to use the car’s crossbows and javelin tubes ...

Maybe.

He leaned forward, unsure of his own motives. ‘What’s happened to him?’ The woman hesitated, but the boy piped up loyally, his thin, clear voice transmitted well by the Speaker tubes. ‘Adda was gored by a boar.’

The old man spat a harsh laugh. ‘Oh, rubbish. I was mangled by a pregnant sow. Stupid old fool that I am.’ Now he seemed to be struggling to push himself away from his tree trunk to reach for a weapon. ‘But not so stupid, or old, that I can’t turn your last few minutes of life into hell, Pole man.’

Toba locked eyes with the strong woman. She raised her spear and grimaced ... and then, shockingly, disarmingly, her face broke up into laughter.

Toba, startled, found himself laughing back.

The woman jabbed her spear at Toba, barely threatening now. ‘You. Toba Paxxax.’

‘Mixxax. Toba Mixxax.’

‘I am Dura, daughter of Logue.’

He nodded to her.

She said, ‘Look, you can see we’re in trouble here. Why don’t you get out of your pig-box and give us some help?’

He frowned. ‘What kind of help?’

She looked towards the old man, apparently exasperated. ‘With him, of course.’ She stared at the car with new eyes, as if appraising the subtlety of its design. ‘Maybe you could help us fix up his wounds.’

‘Hardly. I’m no doctor.

Dura frowned, as if the word wasn’t familiar to her. ‘Then at least you can help us get him out of the forest. Your box would be safe here until you got back.’

‘It’s called a car,’ he said absently. ‘Carry him where? Your home?’

She nodded and jabbed a spear along the line of the trees, down towards the interior of the Star. ‘A few thousand mansheights that way.’

Mansheights? he thought, distracted. A practical measure, he supposed ... but what was wrong with microns? A mansheight would be about ten microns - a hundred-thousandth of a metre - if it meant what it sounded like ...

‘What kind of facilities do you have there?’

‘ ... Facilities?’

Her hesitation was answer enough. Even if Toba were inclined to risk his own health carting this old chap around the forest, there was evidently nothing waiting for him at home but more of these naked savages living in some unimaginable squalor. ‘Look,’ he said, trying to be kind, ‘what’s the point? Even if we got there in time ...’

‘ ... there’d be nothing we could do for him.’ Dura’s eyes were narrow and troubled. ‘I know. But I can’t just give up.’ She looked at Toba, through

his window, with what looked like a faint stab of hope. ‘You talked about your property. Is it far from here? Do you have any - ah, facilities?’

‘Hardly.’ Of course there were basic medical facilities for the coolies, but nothing with any more ambition than to patch them up and send them back to work. Frankly, if one of his coolies were injured as badly as old Adda he’d expect him to die.

He’d write him off, in fact.

Only in Parz itself would there be treatment of the quality needed to save Adda’s life.

He picked up his reins, trying to refocus his attention on his own affairs. He had plenty of problems of his own, plenty of work to finish before he’d see Ito and Cris again. Maybe he could be charitable - give these upfluxers the chance to get away. After all, they weren’t really likely to damage his ceiling-farm ...

‘I’m sorry,’ he said, trying to get out of this surprisingly awkward situation with some kind of dignity. ‘But I don’t think ...’

The woman, Dura, stared through his window, her eyecups deep and sharp, acute; Toba felt himself shudder under the intensity of her perception. ‘You know a way to help him,’ she said slowly. ‘Or you think you do. Don’t you? I can see it in your face.’

Toba felt his mouth open and close, like the vent of a farting Air-piglet. ‘No. Damn it ... Maybe. All right, maybe. *If* we could get him to Parz. But even then there’d be no guarantee ...’ He laughed. ‘And anyway, how do you plan to pay for the treatment? Who are you, Hork’s long-lost niece? If you think I have funds to cover it ...’

‘Help us,’ she said, staring straight into his eyecups.

It wasn’t a request now, he realized, or a plea; it was an *order.*

He closed his eyes. *Damn it.* Why did these things have to happen to him? Didn’t he have enough problems? He almost wished he’d simply blasted this lot with the crossbows before they had a chance to open their mouths and confuse him.

Unwilling to let himself think about it further, he pulled an Air-tank from beneath his seat, and reached out to open the door of the car.

A circular crack appeared in one previously seamless wall of Toba Mixxax’s wooden box - of his *car*. At this latest surprise Dura couldn’t help

but flinch backwards, raising her spear at the lid of wood which began to hinge inwards into the car.

The door opened fully with a sigh of equalizing pressure. The richness of the car's Air wafted out over her, so thick it almost made her cough; she got one deep breath of it, and for a few heartbeats she felt invigorated, filled with energy. But then the Air dispersed into the stale, sticky thinness of the forest; and it was gone, as insubstantial as a dream. Obviously there had been more Air inside the compartment than out ... but that made sense, of course. Why else ride around in a wooden prison, dependent on the cooperation of young pigs, other than to carry with you enough Air to sit in comfort?

Toba Mixxax emerged from his car. Dura watched, wary and wide-eyed. Mixxax stared back at her. For long seconds they hung there, eyes raking over each other.

Mixxax was wearing *clothes*. Not just a belt, or a carrying-pouch, but a suit of some kind of leather which encased him all over. She'd never seen anything so restrictive. And useless. It wasn't as if it had a lot of pockets, even. And he wore a hat on his head, with a veil of some clear, light material dangling over his face. Tubes led from the veil to a pack on his back. A medallion, a wheel shape, hung on a chain around his neck.

Mixxax was a good five years older than Dura herself, and only perhaps fifteen years younger than her father at the time of his death. Old enough for his hair - what she could see of it - to have mostly yellowed and for a network of lines to have accumulated around shallow eyecups. In the forest's thin Air he seemed breathless, despite his hat and veil. He was short - a head shorter than she was - and looked well fed: his cheeks were round and his belly bulged under his clothes. But, despite his cargo of fat, Mixxax was not well muscled. His neck, arms and upper legs were thin, the muscles lost under the concealing layers of leather; his covered head wobbled slightly atop a neck that was frankly scrawny.

In a fair contest, Dura realized slowly, Mixxax would be no match for her. In fact, he'd be hard pressed to defend himself against Farr. Had all the people of his strange home - *Parz City* - become so atrophied by riding around in pig-drawn cars?

Dura began to feel confident again. Toba Mixxax was strange, but he obviously wasn't much of a threat.

She found her gaze drawn back to the medallion suspended from his neck. It was about the size of her palm, and consisted of an open wheel against which was fixed a sketchy sculpture of a man, with arms and legs outstretched against the wheel's five spokes. The work was finely done, with the expression on the face of the little carved man conveying a lot of meaning: pain, and yet a kind of patient dignity.

But it wasn't the form of the pendant but its material which was causing her to stare. It was carved of a substance she'd never seen before. Not wood, certainly; it looked too smooth, too heavy for that. What, then? Carved bone? Or ...

Mixxax seemed to become aware of her gazing at the pendant; with a start, oddly guilty, he masked the device in the palm of his hand and tucked it inside the neck of his jacket, out of sight.

She decided to puzzle over this later. One more mystery among many ...

'Dura,' Toba said. His voice sounded a lot better than the distorted croak she'd heard through the walls of the car.

'Thank you for helping us.'

He frowned, his fat cheeks pulling down. 'Don't thank me until we find out if there's anything to be done. Even if he survives the trip back to Parz, there's no guarantee I'll find a doctor to treat an upfluxer like him.'

Upfluxer ?

'And even if I do I don't know how you're going to pay ...'

She dismissed this with a wave of her hand. 'Toba Mixxax, I'd rather deal with these mysterious problems when I come to them. For now, we should concentrate on getting Adda into your box ... your *car*.'

He nodded, and grinned. 'Yes. And that's not going to be so easy.'

With a few brisk Waves, and with Mixxax clumsily following, Dura crossed to the little group of Human Beings. Farr's gaze swivelled between Dura's face, Mixxax's hat, and back again; and his mouth gaped like a third, huge eyecup. Dura tried not to smile. 'All right, Farr. Don't stare.'

Philas was cradling Adda's battered head. Adda turned his blinded face to them. 'Clear off, Parz man.' His voice was a bubbling croak

Mixxax ignored the words and bent over the old man. Dura seemed to see Adda's wounds through the stranger's eyes - the splayed right arm, the crushed feet, the imploded chest - and she felt a knife twist in her heart.

Mixxax straightened up. His expression was obscured by his veil. ‘I was right. It’s not going to be easy, even getting him as far as the car,’ he said quietly.

‘Then don’t bother,’ Adda hissed. ‘Dura, you bloody fool ...’

‘Shut up,’ Dura said. She tried to think her way through the situation. ‘Maybe,’ she said slowly, if we could bind him up - tie him closely to splints made out of our spears - it wouldn’t be so bad.’

‘Yes.’ Mixxax looked around. ‘But those ropes you have, and the nets, would just cut into him.’

‘I know.’ She looked appraisingly at Mixxax’s clothes. ‘So maybe ...’

After a while, he grasped what the was asking; and with a resigned sigh he started to peel off his trousers and jacket. ‘Why me?’ he muttered, almost too quietly for her to hear.

He wore clothes even *under his clothes*. His chest, arms and legs were bare, but he wore substantial shorts of leather which covered his crotch and lower stomach. He kept his hat on.

He looked even scrawnier of limb, flabbier of belly, without his clothes. In fact, he looked ridiculous. Dura forbore to comment.

The Human Beings wore simple garments sometimes, of course - ponchos and capes, if the Air blew especially cold. But clothes under clothes?

Adda swore violently as they strapped him - with knotted trouser legs and sleeves - to a makeshift frame of spears. But he was too weak to resist, and within a few minutes he was encased in a cocoon of soft leather, his blind face twisting to and fro as if in search of escape.

Dura and Mixxax, with a scared Philas still cradling Adda’s fragile head, slid Adda’s cocoon carefully into the pig-car. Mixxax climbed in after it and set to work fixing it in place at the rear of the cabin with lengths of rope. Even now, Dura could hear from outside the car, Adda continued to curse his saviour.

Dura smiled at Philas, tired. ‘Old devil.’

Philas did not respond. Her eyes, as she stared at the car, were wide ... in fact, Dura slowly realized, her fear now was the strongest emotion the woman had shown since the death of Esk.

Dura reached out and took Philas’s hand. It trembled against her palm, like a small animal. ‘Philas,’ she said carefully. ‘I need your help.’

Philas turned her face, long, grief-lined, towards Dura.

Dura went on, ‘I need to return to the Human Beings. To organize another hunt ... You see that, don’t you? But someone has to go with Adda, in the car, to this - Parz City.’

Philas almost spat the word. ‘*No.*’

‘Philas, you must. I ...’

‘Farr. Send him.’

Dura stared at the woman’s hard, empty-eyed expression; anger and fear radiated out, shocking her. ‘Farr’s just a kid. You can’t be serious, Philas.’

‘Not me.’ Philas shook her head stiffly, the muscles of her neck stiff with rage. ‘I’m not getting in that thing, to be taken away. No. I’d rather die.’

And Dura, despairing, realized that the widow meant it. She tried for some while to persuade Philas, but there was no chink in the younger woman’s resolution.

‘All right, Philas.’ Problems revolved in her head: the tribe, Farr ... Her brother would have to come with her, in the car, of course. Adda had been correct in intuiting that Dura would never be able to relax if Farr were out of her sight for long. She said to Philas, ‘Here is what you must do.’ She squeezed the woman’s hand, hard. ‘Go back to the Human Beings. Tell them what has happened. That we are safe, and that we’re going to get help for Adda. And we’ll return if we can.’

Philas, her transfixing terror abating, nodded carefully.

‘They must hunt again. Tell them that, Philas; try to make them understand. Despite what’s befallen us. Otherwise they’ll starve. Do you understand? You must tell them all this, Philas, and make them hear.

‘I will. I’m sorry, Dura.

Dura felt an impulse to embrace the woman then; but Philas held herself away. The two women hovered in the Air, unspeaking, awkward, for a few heartbeats.

Dura turned away from Philas to face the door of the car. It was dark in there, like a mouth.

Terror spurted in her, sudden and unexpected. She fought to move forward, to keep from shivering.

She was scared of the car, of Parz City, of the unknown. Of course she was. She wondered now if that fear, lurking darkly at the back of her head,

was truly what had impelled her to order Philas to go with Toba, regardless of any other justification. And she wondered if Philas had perceived that, too.

Here was another layer, she thought tiredly, to add to an already overcomplex relationship. Well, maybe that was the nature of life.

Dura turned and climbed slowly into the car; Farr, wordless, meek, followed.

The man from the Pole, much less impressive without his outer garments, watched them climb aboard. The car proved to be cramped with the four of them - plus Adda's improvised cocoon and an expansive seat for Mixxax before an array of controls. Mixxax pulled off his hat and veil with every expression of relief. He pulled a lever; the heavy door swung outward.

Just before she was sealed away from the forest, Dura called out: 'And Philas! Give them our love ...'

The door settled into its frame with a dull impact. Mixxax pulled another lever: a hiss, startlingly loud, erupted from the walls around them.

Air flooded the cabin. It was sweet, invigorating, and it filled Dura's head - but it was, she reminded herself, *alien*. She found a corner and huddled into it, pulling her knees to her chest.

Mixxax looked around. He seemed puzzled. 'Are you all right? You look ill.

Dura fought the urge to lunge at him, to batter at the clear panels of wood set in the walls. 'Toba Mixxax, we are Human Beings,' she hissed. 'We have never, in our lives, been confined inside a box before. Try to understand how it feels.'

Toba seemed baffled. Then he turned away and, looking self-conscious, hauled on reins that passed through the wooden walls.

Dura's belly lurched as the car jerked into motion. 'Toba. Where is this City of yours?'

'At the South Pole,' he said. 'Downflux. As far downflux as it's possible to go.'

Downflux ...

Dura closed her eyes.

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5

Dura emerged reluctantly from sleep.

She could feel the laxness of her muscles, the slow rhythm of her heart, the rich, warm Air of the car pulsing through her lungs and capillaries. She opened her eyecups slowly and glanced around the cramped, boxy interior of the car.

The only light came from four small, clear sections of wall - *windows*, Mixxax had called them - and the little wooden room was immersed in semi-darkness. It was a bizarre situation: to take a shit, she'd had to open a panel and squat over a tube; when she pulled a little lever the waste had been sucked away into the Air. The cabin itself was constructed of panels of wood fixed to a framework of struts and spars. The frame surrounded her, she thought fancifully, like the rib cage of some immense, protective creature. Still half-asleep, she remembered absently her feelings of threat when first climbing into the car. Now, after less than a day, she felt only a womb-like security; it was astonishing how quickly humans could adjust.

Adda's stretcher was still secured to the struts to which they had strapped it. Adda himself seemed to be asleep - or rather, unconscious. He breathed noisily, his mouth gaping and dribbling fluid; his eyes were half-open, but even his good eye was a small lake of pus which leaked slowly onto his cheek and forehead; small, harmless symbiotes covered his cheeks, lapping at the pus. Farr was curled, asleep, into a tight ball, wadded into one corner of the boxy cabin; his face was tucked into his knees and his hair waved gently as he breathed.

Mixxax sat in his comfortable-looking seat before his array of levers and gadgets. He had his back to her, his eyes focused on the journey ahead of them. As he sat in his undershorts she could see afresh how thin and bony this man from the City really was, how pale his flesh. But, at this moment, in control of his vehicle, he radiated calm and competence. It was that very calmness, the feeling of being in a controlled, secure environment - coupled with the exhaustion of the abortive hunt, the stress of Adda's injuries, the thinness of the forest Air - that had lulled Dura and Farr to fall asleep almost instantly, once the car had begun its journey.

Well, Dura was grateful for this brief interlude of peace. Soon enough the pressures of the outside world would return - the responsibilities of

Adda’s illness, Farr’s vulnerability and need for protection, the unimaginable strangeness of the place to which they were being taken. Before long she would be looking back on this brief, secure interlude in the confining walls of the car with nostalgic affection.

Unwinding slowly, stretching to get the stiffness out of her muscles, she pushed out of her corner and glided across the small cabin to Mixxax’s seat. She anchored herself by holding on to the back of the chair and peered past him out of his window.

Toba Mixxax gave a start, flinching away from her. Dura had to suppress a laugh at the moment of near-panic on his broad face.

‘I’m sorry,’ he said quietly. ‘I thought you were asleep.’

‘The others still are, I think. How long was I out?’

He shrugged. ‘A while.’

She peered out of Mixxax’s window, squinting a little at the golden brightness of the Air. From the front face of the car, leather leaders led to a light wooden framework which constrained the strong young Air-pigs Mixxax called his ‘team’. The labouring pigs were emitting green clouds of jetfart, so dense they half-obscured the animals themselves; but they were making the car sail along the vortex lines, she saw. Thin leather ropes - reins - were attached to the pierced fins of the pigs and led, through a tight membrane in the front face of the cabin, to Mixxax’s hands; Mixxax held the reins almost casually, as if his control of the pigs and car was unthinking, automatic. Dura fantasized briefly about living in such a place as this magical Parz City, where the ability to direct a car like this came as naturally as Waving.

Her eye followed the tunnel of vortices far ahead of the car to the distinct point where they merged, obscuring infinity. And just beyond that red-white point at infinity she made out the dull glow of the South Pole . . . and perhaps, she wondered, the glow of Parz City itself.

The Crust sailed over them like an immense ceiling, detail whipping past her with disconcerting speed. The trees through which she had hunted still grew here. They dangled from the diaphanous substance of the Crust and followed the Magfield lines like hair-tubes; the cup-shapes of their neutrino leaves sparkled as her view of them shifted. But the trees seemed to be thinning: she discerned patches of Crust separating small, regular-looking stands of trees.

. . . And the exposed Crust was not bare: rectangular markings coated it, each perhaps a hundred mansheights across. The rectangles were characterized by slight differences of colour, varieties of texture. Some contained markings which swept across the patches in the direction of the Magfield like trapped vortex lines, but the patterns in others worked aslant from the Magfield direction - even perpendicular to it. And some bore no markings at all, save for random stipples of deeper colour.

She stared into the South. The rectangular enclosures covered the Crust from this point in, she saw, marking it out in a patchwork that receded into the misty infinity beyond the end of the vortex lines. Small forms moved across the enclosures, patiently working: humans, dwarfed by distance and by the scale of the enclosures. Here and there she made out the boxy forms of Air-cars drifting through groups of humans, supervising and inspecting.

She felt humbled, dwarfed. The cap of Crust around the Pole was *cultivated* - but on an immense scale.

Before this journey she had never seen any artifact larger than the Human Beings' Net. The car of Toba Mixxax, with its unending complexity, was impressive enough, she supposed - but these markings across the Crust were of another order entirely: artifice on a grand enough scale to challenge the curvature of the Star itself.

And put there by humans, like herself. She fought back awe.

She sought for the words Mixxax had used. '*Ceiling-farm*,' she recalled at last. 'Toba Mixxax, this is your . . . ceiling-farm.'

He laughed, an edge of bitterness in his voice. 'Hardly. These fields are much too lush for the likes of me. No, we passed the borders of my ceiling-farm long ago, while you were sleeping . . . poor as it is, you probably wouldn't have been able to distinguish it from the forest. When I picked you up we were about thirty metres from the Pole. We're within about five metres of Parz now; here the Air is thicker, warmer - the structure of the Star is different, just over the Pole itself - and people can live and work much higher, close to the Crust itself.' He waved a hand, the reins resting casually in his grasp. 'We're getting into the richest arable area. The Crust farms from this point in are owned by much richer folk than me. Or better connected . . . You wouldn't think it possible for one man to have as many brothers-in-law as Hork IV. Even worse than his father was. And . . .'

'What are they doing?'

‘Who?’

She pointed to the fields. ‘The people up there.’

He frowned, apparently surprised by the question. ‘They’re coolies,’ he said. ‘What I mistook your people for. They’re working the fields.’

‘Growing pap for the City,’ came a growl from behind them.

Dura turned, startled. Adda was awake; though his pus-filled eyecups were as sightless as before, he held himself a little stiffer in his cocoon of clothes and rope and his mouth was working, bubbles of spittle erupting from its corner.

Dura swam quickly to his side. ‘I’m sorry we woke you,’ she whispered. ‘How are you feeling?’

His mouth twisted and his throat bubbled, in a ghastly parody of a laugh. ‘Oh, terrific. What do you think? If you were any better-looking I’d invite you in here to keep me warm.’

She snorted. ‘Don’t waste your Air on stupid jokes, you old fool.’ She tried to adjust the position of his neck, smoothing out rucks in the rolled-up cloth around it.

Each time she touched him he winced.

Toba Mixxax turned. ‘There’s food in that locker,’ he said, pointing. ‘We’ve still a long way to go.’

In the place he’d indicated there was a small door cut into the wall, fixed by a short leather thong; opening it, Dura found a series of small bowls, each covered by a tight-fitting leather skin. Peeling away one of the skins she found pads of some pink, fleshy substance, each about the size of her palm. She took a pad and nibbled at it.

It was about as dense as meat, she supposed, but with a much softer texture. And it was delicious - like the leaves of the trees, she thought. But, as far as she could tell from her small sample, a lot denser and more nutritious than any leaf.

When was the last time she had eaten? It was all she could do not to cram the strange food into her own mouth.

She pulled three of the food pads out of the bowl, then covered over the bowl and stowed it away in its cupboard, desperate that the heavily scented photons which seeped from the food shouldn’t wake up Farr.

She held a pad to Adda’s lips. ‘Eat,’ she ordered.

‘City man’s pap,’ he grumbled; but, feebly, he bit into the pad and chewed at it.

‘There’s nothing wrong with it,’ she whispered as she fed him. ‘It’s just food.’

‘And it’s good for you,’ Toba Mixxax called in a loud whisper, turning in his seat to watch. ‘It’s better for your health than meat, in fact. And . . .’

‘But what is it?’ Dura asked.

‘Why, it’s bread, of course,’ he said. ‘Made from wheat. From my ceiling-farm. What did you think it was?’

‘Ignore him,’ Adda rasped. ‘And don’t give him the satisfaction of asking what wheat is. I can see you want to.’

‘You can’t see any damn thing,’ she said absently. She paused. ‘Well, what *is* wheat, anyway?’

‘Cultivated grass,’ Toba said. ‘The stuff which grows wild in the forest is good enough for Air-pigs, but it wouldn’t keep you or I alive long. But wheat is a special type of grass, a strain which needs to be tended and protected - but which contains enough proton-rich compounds from the Crust to feed people.’

‘On pap,’ Adda growled.

‘Not pap. Bread,’ Mixxax said patiently.

Dura frowned. ‘I don’t think I understand. Air-pigs eat grass and we eat pigs. That’s the way things work. What’s wrong with that?’

Mixxax shrugged. ‘Nothing, if you don’t have the choice. And if you want to spend your life chasing around forests in search of pigs. But the fact is, per cubic micron of Crust root ceiling, you can get more food value out of wheat than grazing pigs. And it’s economically more efficient in terms of labour to run wheat ceiling-farms rather than pig farms.’ He laughed, with infuriating kindness. ‘Or to hunt wild pigs, as you people do. After all, wheat stays in one place. It doesn’t jetfart around the forest, or attack old men.’ He looked sly. ‘Anyway, there are some things you won’t get except from cultivated crops. Beercake, for instance ..

‘*Efficient*,’ Adda hissed. ‘That was one of the words they used when they drove us away from the Pole.’

Dura frowned. ‘Who drove us away?’

‘The authorities in Parz,’ he said, his sightless eyes leaking disconcertingly. ‘I’m talking of a time ten generations ago, Dura . . . We

don’t talk of these things any more. The princelings, the priests, the Wheelwrights. Drove us away from the thick, warm Air of the Pole and out into the deserts upflux. Drove us out for our faith, because we looked to a higher authority than them. Because we wouldn’t work on their ceiling-farms; we wouldn’t accept slavery. Because we wouldn’t be *efficient*.’

‘Coolies aren’t slaves,’ Toba Mixxax said heatedly. ‘Every man and woman is free in the eyes of the law of Parz City, and . . .’

‘And I’m a Xeelee’s grandmother,’ Adda said wearily. ‘In Parz, you are as free as you can afford to be. If you’re poor - a *coolie*, or a coolie’s son - you’ve no freedom at all.’

Dura said to Adda, ‘What are you talking about? Is this how you knew where Toba was from - because we were from Parz City too, once?’ She frowned. ‘You’ve never told me this. My father . . .’

Adda coughed, his throat rattling. ‘I doubt if Logue knew. Or, if he did, if he cared. It was *ten generations ago*. What difference does it make now? We could never return; why dwell on the past?’

Mixxax said absently, ‘I still haven’t worked out what to do if you incur costs for the old man’s medical treatment.’

‘It doesn’t take much imagination to guess,’ Adda hissed. ‘Dura, I told you to drive away this City man.’

‘Hush,’ she told him. ‘He’s helping us, Adda.’

‘I didn’t want his help,’ Adda said. ‘Not if it meant going into Parz itself.’ He thrashed, feebly, in his cocoon of clothes. ‘I’d rather die. But I couldn’t even manage that now.’

Frightened by his words, Dura pressed against Adda’s shoulders with her hands, forcing him to lie still.

Toba Mixxax called cautiously, ‘You mentioned “Xeelee” earlier.’

Dura turned to him, frowning.

He hesitated. ‘Then that’s your faith? You’re Xeelee cultists?’

‘No,’ Dura said wearily. ‘If that word means what I think it means. We don’t regard the Xeelee as gods; we aren’t savages. But we believe the goals of the Xeelee represent the best hope for . . .’

‘Listen,’ Toba said, more harshly, ‘I don’t see that I owe you any more favours. I’m doing too much for you already.’ He chewed his lip, staring out at the patterned Crust through his window. ‘But I’ll tell you this anyway.

When we get to Parz, don’t advertise your faith - your belief, about the Xeelee. Whatever it is. All right? There’s no point looking for trouble.’

Dura thought that over. ‘Even more trouble than following a wheel?’

Adda turned blind eyes to her. Mixxax twisted, startled. ‘What do you know about the Wheel?’

‘Only that you wear one around your neck,’ she said mildly. ‘Except when you think you need to hide it.’

The City man yanked on his reins angrily.

Adda had closed his eyes and breathed noisily but steadily, evidently unconscious once more. Farr still slept. With a pang of guilt, Dura rammed the last morsels of the food - the *bread* - into her mouth, and slid forward to rejoin Mixxax at his reins.

She gazed through the windows. Bewildering Crust detail billowed over her head. Even the vortex lines seemed to be racing past her, and she had a sudden, jarring sensation of immense speed; she was plummeting helplessly towards the mysteries of the Pole, and the future.

Toba studied her, cautious but with traces of concern. ‘Are you all right?’

She tried to keep her voice steady. ‘I think so. I’m just a little taken aback by the speed of this thing, I suppose.’

He frowned and squinted out through his window. ‘We’re not going so fast. Maybe a metre an hour. After all, it’s not as if we’ve got to work across the Magfield; we’re simply following the flux lines home . . . To my home, anyway. And, this far downflux, the pigs are getting back the full strength they’ll have at the Pole. There they could reach maybe twice this speed, with a clear run.’ He laughed. ‘Not that there’s any such thing as a clear run in Parz these days, despite the ordinances about cars inside the City. And the top teams . . .’

‘I’ve never been in a car before,’ she hissed, her teeth clenched.

He opened his mouth, and nodded. ‘No. True. I’m sorry; I’m not very thoughtful. ’ He mused, ‘I guess I’d find it a little disconcerting if I’d never ridden before - if I hadn’t been riding since I was a child. No wonder you’re feeling ill. I’m sorry; maybe I should have warned you. I . . .’

‘Please stop apologizing.’

‘Anyway, we’ve made good time. Considering it’s such a hell of a long way from the Pole to my ceiling-farm.’ His round face creased with anger.

‘Humans can’t survive much more than forty, fifty metres from the Pole. And my ceiling-farm is right on the fringe of that, right on the edge of the hinterland of Parz. So far upflux the Air tastes like glue and the coolies are weaker than Air-piglets . . . How am I supposed to make a living in conditions like that?’ He looked at her, as if expecting an answer.

‘What’s a metre?’

‘. . . A hundred thousand mansheights. A million microns.’ He looked deflated, his anger fading. ‘I don’t suppose you know what I’m talking about. I’m sorry; I . . .’

‘How deep is the Mantle?’ she asked impulsively. ‘From to Crust to Quantum Sea, I mean.’

He smiled, his anger evaporating visibly. ‘In metres, or mansheights?’

‘Metres will do.’

‘About six hundred.’

She nodded. ‘That’s what I’ve been taught, too.’

He studied her curiously. ‘You people know about things like that?’

‘Yes, we know about things like that,’ she said heavily. ‘We’re not animals; we educate our children . . . even though it takes most of our energy just to keep alive, without clothes and cars and Air-boxes and teams of captive Air-pigs.’

He winced. ‘I won’t apologize again,’ he said ruefully. ‘Look . . . here’s what I know.’ Still holding his reins loosely, he cupped his long-fingered, delicate-looking hands into a ball. ‘The Star is a sphere, about twenty thousand metres across.’

She nodded. *Two thousand million mansheights.*

‘It’s surrounded by the Crust,’ he went on. ‘There’s three hundred metres of that. And the Quantum Sea is another ball, about eighteen thousand metres across, floating inside the crust.’

She frowned. ‘Floating?’

He hesitated. ‘Well, I think so. How should I know? And between the Crust and the Quantum Sea is the Mantle - the Air we breathe - about six hundred metres deep.’ He looked into her face, a disconcerting mixture of suspicion and pity evident there. ‘That’s the shape of the Star. The world. Any kid in Parz City could have told you all that.’

She shrugged. ‘Or any Human Being. Maybe there was no difference once.’

She wished Adda were awake, so she could learn more of the secret history of her people. She turned her face to the window.

In the last hours of the journey the inverted Crust landscape changed again.

Dura, with Farr now awake and at her side, stared up, fascinated, watching the slow evolution of the racing Crustscape. There was very little left of the native forest here, although a few trees still straggled from small copses. The clean, orderly regularity of the fields they'd passed under to the North - further *upflux*, as she was learning to call it - was breaking up into a jumble of forms and textures.

Farr pointed excitedly, his eyes round. Dura followed his gaze.

They weren't alone in the sky, she realized: in the far, misted distance something moved - not a car; it was long, dark, like a blackened vortex line. And like Mixxax's car it was heading for the Pole, threading along the Magfield.

She said, 'That must be thousands of mansheights long.'

Toba glanced dismissively. 'Lumber convoy,' he said. 'Coming in from upflux. Nothing special. Damn slow, actually, if you get stuck behind one.'

Soon there were many more cars in the Air. Mixxax, grumbling, often had to slow as they joined streams of traffic sliding smoothly along the Magfield flux lines. The cars came in all shapes and sizes, from small one-person buggies to grand chariots drawn by teams of a dozen or more pigs. These huge cars, covered in ornate carvings, quite dwarfed poor Mixxax's; Toba's car, thought Dura, which had seemed so grand and terrifying out in the forest upflux, now appeared small, shabby and insignificant.

Much, she was coming to realize, like its owner.

The colours of the Crust fields were changing: deepening and becoming more vivid. Farr asked Mixxax, 'Different types of wheat?'

Mixxax showed little interest in these rich regions from which he was excluded. 'Maybe. Flowers, too.'

'Flowers?'

'Plants bred for their beauty - their shape, or colour; or the scent of the photons they give off.' He smiled. 'Actually, Ito grows some blooms which . . .'

'Who's Ito?'

‘My wife. Nothing as grand as this, of course; after all, we’re flying over the estates of Hork’s court now.’

Farr had his face pressed to a window of the car. ‘You mean people grow plants just for the way they look?’

‘Yes.’

‘But how do they live? Don’t they have to hunt for food, as we do?’

Dura shook her head. ‘Folk here don’t hunt, Farr. I’ve learned that much. They grow special kinds of grasses, and eat them.’

Mixxax laughed bitterly. ‘“Folk here”, as you call them, don’t even do that. *I* do that, in my scrubby farm on the edge of the upflux desert. I grow food to feed the rich folk in Parz . . . and I pay them taxes so they can afford to buy it. And that,’ he finished bitterly, ‘is how Hork’s courtiers have enough leisure time to grow flowers.’

The logic of that puzzled Dura, but - understanding little - she let it pass.

Now, suddenly, the queue of cars in front of them cleared aside, and the view ahead was revealed.

Dura heard herself gasp.

Farr cried out, sounding like a small child. ‘What is it?’

Mixxax turned and grinned at him, evidently enjoying his moment of advantage. ‘That,’ he said, ‘is Parz City. We have arrived.’

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6

Muub arrived at the Reception Gallery shortly before the start of the Grand Tribute. He moved to the front of the Gallery, so that he could see down the full depth of Pall Mall, and selected a body-cocoon close to Vice-Chair Hork's customary place. A servant drifted around him for a few moments, adjusting the cocoon so it fit snugly, and offered him drinks and other refreshments. Muub, unable to shake off weariness, found the harmless little man as irritating as an itch, and he chased him away.

Muub looked down. Pall Mall was the City's main avenue. Broad and light-filled, it was a rectangular corridor cut vertically through the complex heart of Parz - from the elaborate superstructure of the Palace buildings at the topmost Upside, down through hundreds of dwelling levels, all the way to the Market, the vast, open forum at the centre of the City. The Reception Gallery was poised at the head of Pall Mall, just below the Palace buildings themselves; Muub, trying to relax in his cocoon, was bathed in the subtly shaded light filtering down through the Palace's lush gardens, and was able to survey, it seemed, the whole of the City as if it were laid open before him. Pall Mall itself glowed with light from the Air-shafts and wood-lamps which lined its perforated walls; threads of the shafts, glowing green and yellow, converged towards the Market itself, the City's dusty heart. The great avenue - normally thronged with traffic - was deserted today, but Muub could make out spectators peering from doors and viewing-balconies: ordinary little faces turned up towards him like so many flowers. And in the Market itself - all of five thousand mansheights below the Palace - the Tribute procession was almost assembled, as thousands of common citizens gathered to present the finest fruit of this quarter's labour to the Committee. No cocoons down there, of course; instead the Market was criss-crossed by ropes and bars to which people clung with their hands or legs, or hauled themselves along in search of vantage points. To Muub, staring down at the swarming activity, it was like gazing into a huge net full of young piglets.

The Gallery itself was laced with ropes of brushed leather - to guide those Committee members and courtiers, Muub thought sourly, too poor to be simply carried to their cocoons. The Gallery's cool, piped Air was scented with fine Crust-flowers. Vice-Chair Hork was already in his place close to Muub, alongside the vacant cocoon reserved for his father, Hork IV.

Hork glared ahead, sullen and silent in his bulk and glowering through his beard. Perhaps half the courtiers were in their places; but they had congregated towards the rear of the Gallery, evidently sensing, in their dim, self-seeking way, that today was not a good day to attract the attention of the mercurial Vice-Chair.

So already the elaborate social jostling had begun. It would be a long day.

In fact - thanks to the recent Glitch - it had already been a long day for Muub. The latest in a series of long days. He was principal Physician to the First Family, but he also had a hospital to run - indeed, the retention of his responsibilities at the Hospital of the Common Good had been a condition of his acceptance of his appointment to Hork's court - and the burden placed on his staff by the Glitch had still to unravel. He studied the vapid, pretty, ageing faces of the courtiers as they preened in their finery, and wondered how many more ravaged bodies he would have to tend before sleep claimed him.

Vice-Chair Hork seemed to notice him at last. Hork nodded to him. Hork was a bulky man whose size gave him an appearance of slowness of wit - a deceptive appearance, as more than one courtier had found to his cost. Under his extravagant beard - extravagantly manufactured, actually, Muub reflected wryly - Hork's face had something of the angular nobility of his father's, with those piercing, deep black eyecups and angular nose; but the features tended to be lost in the sheer bulk of the younger Hork's fleshy face, so that whereas the Chair of the Central Committee had an appearance of gentle, rather bruised nobility, his son and heir appeared hard, tough and coarse, the refined elements of his looks serving only to accentuate his inherent violence. Today, though, Hork seemed calm. 'So, Muub,' he called. 'You've decided to join me. I was fearful of being shunned.'

Muub sighed as he worked his way deeper into his cocoon. 'You glower too much, sir,' he said. 'You frighten them all away.'

Hork snorted. 'Then through the Ring with them,' he said, the ancient obscenity coming easily to his lips. 'And how are you, Physician? You're looking a little subdued yourself.'

Muub smiled. 'I'm afraid I'm getting a little old for my burden of work. I've spent most of the last few days in the Hospital. We're - very busy, sir.'

'Glitch injuries?'

‘Yes, sir.’ Muub rubbed a hand over his shaven scalp. ‘Of course we should have seen the worst now . . . or rather, the more serious cases we have not yet reached must, sadly, be beyond our care. But there remains a steady stream of lesser injuries which . . .’

‘Minor?’

‘Lesser,’ Muub corrected him firmly. ‘Which is very different. Not life-threatening, but still, perhaps, disabling. Most of them patients from the central districts, of course. When Longitude I failed . . .’

‘I know,’ Hork said, chewing his lip. ‘You don’t need to tell me about it.’

Longitude I was an anchor-band, one of four superconducting toroids wrapped around the City to maintain the structure’s position over the South Pole. Longitudes I and II were aligned vertically, while their twins Latitudes I and II were placed horizontally, so that the toroids criss-crossed around the City.

The Glitch had largely spared the Polar regions, the City itself. But at the height of the Glitch, with vortex lines tangling around the City, Longitude I had failed. The City had rattled in its superconducting cage like a trapped Air-pig. The anchor-band’s current had been restored quickly, and the effects on the external parts of the structure - such as the Spine and the Committee Palace - had been minimal. But it had been in the hidden interior of the City, where thousands of clerks and artisans toiled their lives away, that the most serious injuries had been incurred.

‘Do we have any figures on the casualties yet?’

Muub looked at the Vice-Chair. ‘I’m surprised you’re asking me. I’m your father’s Physician, but I’m really just one Hospital Administrator - one of twelve in all of Parz.’

Hork waved fat fingers. ‘I know that. All right, forget I asked. I just wanted your view. The trouble is that the agencies which gather statistics like that for us are precisely those which were wrecked by the Glitch itself.’ He shook his head, the jowls wobbling angrily. ‘People think gathering information is a joke - unnecessary. A luxury. I suspect even my highly intelligent father shares that view.’ The last few words were spat out, venomously. ‘But the fact is, without such data a government can scarcely operate. I’ve tried to justify this to my father often enough. You see, Doctor, without central government functions, the state is like a body without a

head. We can’t even raise tithes successfully, let alone allocate expenditure.’ Hork grimaced. ‘It makes today’s Grand Tribute look a little pointless, doesn’t it, Physician?’

Muub nodded. ‘I understand, sir.’

‘I tell you, Muub,’ Hork said, still nervously chewing on his bearded underlip, ‘one more Glitch like that and we could be done for.’

Muub frowned. ‘Who are “we”? The government, the Committee?’

Hork shrugged. ‘There are plenty of hotheads, out in the ceiling-farms, in the dynamo sheds, in the Harbour . . . There seems no way of rooting such vermin out. Even Breaking them on the Wheel serves only to create martyrs.’

Muub smiled. ‘A wise observation.’

Hork laughed, displaying well-maintained teeth. ‘And you’re a patronizing old fool who pushes his luck . . . Martyrs. Yet another subtlety of human interaction which seems to evade my poor, absent father.’ Now Hork looked piercingly at Muub; the Physician found himself flinching. ‘And you,’ Hork said. ‘Do you scent rebellion in the Air?’

Muub thought carefully. He knew he wasn’t under any personal suspicion; but he also knew that the Vice-Chair - unlike his father - took careful note of anything said to him. And Hork had dozens, hundreds of informants spread right throughout Parz and its hinterland. ‘No, sir. Although there are plenty of grumbles - and plenty of folk ready to blame the Committee for our predicament.’

‘As if we had called the Glitches down on our own heads?’ Hork wriggled in his cocoon, folds of brushed leather rippling over his ample form. ‘You know,’ he mused, ‘if only that were true. If only the Glitches were human in origin, to be cancelled at a human command. But then, the scholars tell us - repeating what little wisdom was allowed to survive the Reformation - man was brought to this Mantle by the Ur-humans, modified to survive here. If once we had such control over our destiny, why should we not regain it, ultimately?’ He smiled. ‘Well, Physician?’

Muub returned the smile. ‘You’ve a lively mind, sir, and I enjoy debating such subjects with you. But I prefer to restrict my attention to the practical. The achievable.’

Hork scowled, his plaited hair-tubes waving with an elegance that made Muub abruptly aware of his own baldness. ‘Maybe. But let’s not forget that

that was the argument of the Reformers, ten generations ago. And their purges and expulsions left us in such ignorance we can't even measure the damage they did . . .

'Anyway, it's not revolt I fear, Physician. It's more the feasibility of government itself - I mean the viability of our state, regardless of whoever sits in my father's chair.' The man's wide, fleshy face turned to Muub now, full of unaccustomed doubt. 'Do you understand me, Muub? Damn few do, I can tell you, inside this wretched court or out.'

Muub was impressed - not for the first time - by the younger Hork's acuity. 'Perhaps, you fear, the Glitches will render an organized society like Parz City impossible. Revolts will become irrelevant. Our civilization itself will fall.'

'Exactly,' Hork said, sounding almost grateful. 'No more City - no more tithe-collectors, or Crust-flower parks, or artists or scientists. Or Physicians. We'll all have to Wave off to the upflux and hunt boar.'

Muub laughed. 'There are a few who would like to see the back of the tithes.'

'Only fools who cannot perceive the benefits. When every man must not only maintain his own scrubby herd of pigs, but must make, *by hand*, every tool he uses, like the poorest upfluxer . . . then, perhaps, he will look back on taxation with nostalgic affection.'

Muub frowned, scratching at one eyecup. 'Do you think such a collapse is near?'

'Not yet,' Hork said. 'Not unless the Glitches really do smash us wide open. But it's possible, and growing more so. And only a fool closes his eyes to the possible.'

Muub, wary of what traps might lie under the surface of that remark, turned to stare down through the dusty, illuminated Air of Pall Mall.

Hork growled, 'Now I've embarrassed you. Come on, Muub, don't start acting like one of these damn piglet-courtiers. I value your conversation. I didn't mean to imply my father is such a fool.'

' . . . But he does not necessarily share your perspective.'

'No. Damn it.' Hork shook his head. 'And he won't give me the power to do anything about it. It's frustrating.' Hork looked at Muub. 'I hear you saw him recently. Where is he?'

Shouldn't you know? 'He's at his garden, at the Crust. He can't take the thin Air, of course, so he mostly stays in his car, watching the coolies getting on with their work.'

'So he's healthy?'

Muub sighed. 'Your father is an old man. He's fragile. But - yes; he is well.'

Hork nodded. 'I'm glad.' He glanced at the Physician, seeking his reaction. 'I mean it, Muub. I get frustrated with him because I'm not always sure he addresses the key issues. But Hork *is* still my father. And besides,' he went on pragmatically, 'the last thing we need right now is a succession crisis.'

There was a buzz of conversation from around the Gallery.

Hork leaned forward in his cocoon. 'What's going on?'

Muub pointed. 'The pipers are moving into position.' There were a hundred of the pipers, dressed in bright, eye-catching clothes, now Waving out of doorways all along Pall Mall and taking up their positions, lining the route of the parade. The closest pipers - four of them, one to each of the Mall's complex walls - were earnest young men, efficiently stoking the small furnaces they carried on belts around their waists. Fine, tapered tubes led from the furnaces in elaborate whorls to wide, flower-like horns; the horns of polished wood gaped above the head of the pipers like the mouths of shining predators.

'There!' Hork cried, pointing down the avenue, his face illuminated with a mixture of excitement and avarice.

Muub, suppressing a sigh, leaned further forward and squinted down the Mall, trying to pick out the distant specks in the Air that would be the approaching Tribute parade: earnest, overweight citizens bearing vast sheaves of wheat, or grotesquely bloated Air-pigs.

The pipers pushed valves on their furnace-boxes. Within each horn, complex Air patterns swirled, sending pulses of heat along the necks of the horns - pulses which emerged from the horns, by a process which had always seemed magical to the resolutely non-musical Muub, as stirring peals of sound.

Far below, in the Market, the crowd roared.

Toba Mixxax twitched his reins and stared unblinking out of his window. 'I'm going to take him straight into the Hospital. The Common

Good. It’s a decent place. Hork’s own Physician runs it . . .’

Cars of all sizes came hurtling past them in a constant, random stream. Pig teams farted clouds of green gas. Speakers blared. Toba yelled back through his own car’s system, but the amplified voices were too distorted for Dura to understand what was being said.

It was, frankly, terrifying. Dura, hovering with Farr behind Toba’s seat and staring out at the chaotic whirl of hurtling wooden boxes, bit the back of her hand to avoid crying out.

But somehow Toba Mixxax was managing not only to avoid collisions but also to drive them forward - slowly, but forward - to the staggering bulk of the City itself.

‘Of course it’s not the cheapest. The Common Good, I mean.’ Toba laughed hollowly. ‘But then, frankly, you’re not going to be able to afford even the cheapest. So you may as well not be able to afford the best.’

‘Your talk means little, Toba Mixxax,’ Dura said. ‘Perhaps you should concentrate on the cars.’

Toba shook his head. ‘Just my luck to come into town with three upfluxers on the day of the Grand Tribute. Today of all days. And . . .’

Dura gave up listening. She tried to ignore the cloud of hurtling cars in the foreground of her vision, to see beyond them to Parz itself.

The South Magnetic Pole itself was spectacular enough - like a huge artifact, an immense sculpting of Magfield and spin lines. Vortex lines followed - almost - the shape of the Magfield, so it was easy to trace the spectacular curvature of the magnetic flux. It was nothing like the gentle, easy, Star-girdling curvature of her home region, far upflux; here, at the furthest downflux, the vortex lines converged from all over the Mantle and plunged into the bulk of the Star around the Pole itself, forming a funnel of Magfield delineated by sparkling, wavering vortex lines.

And, suspended right over the mouth of that immense funnel, as if challenging the Pole’s very right to exist, the City of Parz hung in the Air.

The City was shaped like a slender, upraised arm, with a fist clenched at its top. The ‘arm’ was a spine of wood which thrust upwards, out of the Pole’s plunging vortex funnel, and the ‘fist’ was a complex mass of wooden constructions which sprawled across many thousands of mansheights. Four great hoops of some glittering substance - ‘anchor-bands’, Toba called them, two aligned vertically and two horizontally - surrounded the fist-

mass; Dura could see struts and spars attaching the hoops to the mass of the ‘fist’.

The ‘fist’, the City itself, was a perforated wooden box, suspended within the hoops. Ports - circular, elliptical and rectangular - punctured the box’s surface, and cars streamed in and out of many of the ports like small creatures feeding off some greater beast. Towards the base of the City the ports were much wider: they gaped like mouths, dark and rather forbidding, evidently intended for bulk deliveries. Into one of these Dura could see tree-stalks being hauled from a great lumberjacking convoy.

Sparkling streams, hundreds of them, flowed endlessly from the base of the City and into the Air, quite beautiful: they were sewer streams, Toba told her, rivers of waste from Parz’s thousands of inhabitants.

As the car veered around the City - Toba, braying incoherently into his Speaker tube, was evidently looking for a port to enter - Dura caught tantalizing glimpses through the many wide shafts of complex structures, layers of buildings *within* the bulk of the City itself. A complex set of buildings perched on the crown of the City, grand and elegant even to Dura’s half-baffled eyes. There were even small Crust-trees arcing into the Air from among those upper buildings. When she pointed this out to Toba he grinned and shrugged. ‘That’s the Committee Palace,’ he said. ‘Expense is little object if you live that far Upside . . .’

Light filled the City, shining from its many ports and casting beams across the dusty Air surrounding it, so that Parz was surrounded by a rich, complex mesh of green-yellow illumination. The City was immense - almost beyond Dura’s imagination - but it seemed to her bright, Air-filled, full of light and motion. People swarmed around the buildings, and streams of Air-cars laced around the spires of the Palace. Even the ‘arm’ below the City-fist, the Spine (as Toba called it) that grew down towards the Pole, bore tiny cars which clambered constantly up and down ropes threaded along the Spine’s length.

The City grew as they approached - growing so huge, at last, that it more than filled the small window of the car. Dura began to find the whole assemblage overwhelming in detail and complexity. She recalled - with a strange feeling of nostalgia - her feelings of panic on first encountering Toba’s car. She’d soon learned to master her panic then, and had come to feel almost in control of this strange, weak person, Toba Mixxax. But now

she was confronted by strangeness on an unimaginably huger scale. Could she ever come to terms with all this - ever again take control over her own destiny, let alone influence events around her?

Her discomfiture must have shown in her expression. Toba grinned at her, not unsympathetically. ‘It must be pretty overwhelming,’ he said. ‘Do you know how big the City is? Ten thousand mansheights, from side to side. And that’s not counting the Spine.’ The little car continued to edge its way, cautiously, around the City, like a timid Air-piglet looking for a place to suckle. Toba shook his head. ‘Even the Ur-humans would have been impressed by ten thousand mansheights, I’ll bet. Why, that’s almost a centimetre . . .’

The car entered - at last - a narrow rectangular port which seemed to Dura to be already filled with jostling traffic. The car pushed deeper into the bulk of the City along a narrow tunnel - a ‘street’, Toba Mixxax called it - through which cars and people thronged. These citizens of Parz were all dressed in thick, heavy, bright clothing, and all seemed to Dura utterly without fear of the streams of cars around them. Dura’s impressions from without of the airiness and brightness of the City evaporated now; the walls of the street closed in around her, and the car seemed to be pushing deeper into a clammy darkness.

At last they came to a gap in the wall of the street, a port leading to a brighter place. This was the entrance to the Hospital, Toba said. Dura watched, silent, as Toba with unconscious skill slid his car through the last few layers of traffic and encouraged the pigs to draw the car gently into the Hospital bay. When the car had been brought to rest against a floor of polished wood, Toba knotted the reins together, pushed his way out of his chair and stretched in the Air.

Farr looked at him strangely. ‘You’re tired? But the pigs did all the work.’

Toba laughed and turned bruised-looking eyes to the boy. ‘Learn to drive, kid, and you’ll know what tiredness is.’ He looked to Dura. ‘Anyway, now comes the hard part. Come on; I’ll need you to help me explain.’

Toba reached for the door of the car. As he released its catch Dura flinched, half-expecting another explosive change of pressure. But the door simply glided open, barely making a noise. Heat washed into the opened

interior of the car; Dura felt the prickle of cooling superfluid capillaries opening all over her body.

Toba led Dura and Farr out of the car, wriggling stiffly through the doorway. Dura put her hands on the rim of the doorway, pulled - and found herself plunging forward, her face ramming into Toba's back hard enough to make her nose ache.

Toba staggered in the Air. 'Hey, take it easy. What's the rush?'

Dura apologized. She looked down at her arms uncertainly. What had that been all about? She hadn't misjudged her own strength like that since she was a child. It was as if she had suddenly become immensely strong . . . or else as light as a child. She felt clumsy, off balance; the heat of this place seemed overwhelming.

Her confidence sank even more. She shook her head, irritated and afraid, and tried to put the little incident out of her mind.

The Hospital bay was a hemisphere fifty mansheights across. Dozens of cars were suspended here, mostly empty and bereft of their teams: harnesses and restraints dangled limply in the Air, and one corner had been netted off as a pen for Air-pigs. One car, much larger than Toba's, was being unloaded of patients: injured, even dead-looking people, tied into bundles like Adda's. A tall man was supervising; he was quite hairless and dressed in a long, fine robe. People - all clothed - moved between the cars, hurrying and bearing expressions of unfathomable concern. A few of them found time to glance curiously at Dura and Farr.

The walls, of polished wood, were so clean that they gleamed, reflecting curved images of the bustle within the bay. Wide shafts pierced the walls and admitted the brightness of the Air outside to this loading bay. Huge rimless wheels - *fans*, Toba told her - turned in the shafts, pushing Air around the bay. Dura breathed in slowly, assessing the quality of the Air. It was fresh, although clammy-hot and permeated by the stench-photons of pigs. But there was something else, an aroma that was at once familiar and yet strange, out of context . . .

People.

That was it; the Air was filled with the all-pervading, stale smell of *people*. It was like being a little girl again and stuck at the heart of the Net, surrounded by the perspiring bodies of adults, of other children. She was hot and claustrophobic, suddenly aware that she was surrounded, here in the

City, by more people than had lived out their lives in her tiny tribe of Human Beings in many generations. She felt naked and out of place.

Toba touched her shoulder. ‘Come on,’ he said anxiously. ‘Let’s get the stretcher out of the car. And then we’ll find someone to . . .’

‘Well. What have we here?’ The voice was harsh, amused, and shared Toba’s stilted accent.

Dura turned. Two men were approaching, Waving stiffly through the Air. They were short, blocky and wore identical suits of thick leather; they carried what looked like coiled whips, and wore masks of stiffened leather which muffled their voices and made it impossible to read their expressions.

The eyes of these anonymous beings raked over Dura and Farr.

She dropped her hands to her hips. The rope she’d taken Crust-hunting was still wrapped around her waist, and she could feel the gentle pressure of her knife, her cleaning scraper, tucked into the rope at her back. She found the presence of these familiar things comforting, but - apart from that little knife - *all their weapons were still in the car*. Stupid, stupid; what would Logue have said? She edged backwards through the Air, trying to find a clear path back to the car.

Toba said, ‘Sirs, I am Citizen Mixxax. I have a patient for the Hospital. And . . .’

The guard who had spoken earlier growled, ‘Where’s the patient?’

Toba waved him to the car. The man peered in suspiciously. Then he withdrew his head from the car, visibly wrinkling his nose under his mask. ‘I don’t see a patient. I see an upfluxer. And here . . .’ - he waved the butt of his whip towards Dura and Farr - ‘I see two more upfluxers. Plus a pig’s-ass in his underpants. But no patients.’

‘It’s true,’ Toba said patiently, ‘that these people are from the upflux. But the old man’s badly hurt. And . . .’

‘This is a Hospital,’ the guard said neutrally. ‘Not a damn zoo. So get these animals out of here.’

Toba sighed and held out his hands, apparently trying to find more words.

The guard was losing patience. He reached out and poked at Dura’s shoulder with one gloved finger. ‘I said get them out of here. I won’t tell . . .’

Farr moved forward. ‘Stop that,’ he said. And he shoved, apparently gently, at the guard.

The man flew backwards through the Air, at last colliding with a wooden-panelled wall. His whip trailed ineffectually behind him.

Farr tipped backwards with the reaction; he looked down at his own hands with astonishment.

The second guard started to uncoil his whip. ‘Well,’ he said softly, ‘maybe a few spins of the Wheel would help you learn your place, little boy.’

‘Look, this is all going wrong,’ Toba said. ‘I didn’t mean for any of this to happen. Please; I . . .’

‘Shut up.’

Dura clenched her fists, ready to move forward. She had no doubt that she and Farr could account for this man, leather armour or not - especially with the immense new strength they seemed to have acquired here. Of course, there were more than two guards in Parz City; and beyond the next few minutes she could envisage a hundred dim and dark ways for events to unfold, flowering like deadly Crust-flowers out of this incident . . . But this moment was all she could influence.

The guard raised the whip to her brother. She reached for her knife and prepared to spring . . .

‘Wait. Stop this.’

Dura turned, slowly; the guard was lowering his whip.

The man who had been supervising the unloading of the other car - tall, commanding, dressed in a fine but begrimed robe, and with a head shockingly denuded of hair-tubes - was coming towards them.

Dura was aware of Toba cringing backwards. The guard looked at Farr and Dura with frustrated hunger.

Dura said, ‘Who are you? What do you want?’

The newcomer frowned. He was about Logue’s age, she judged. ‘Who am I? It’s a long time since I was asked that. My name is Muub, my dear. I am the Administrator of this Hospital.’ He studied her curiously. ‘And you’re an upfluxer, aren’t you?’

‘No,’ she said, suddenly heartily sick of that word. ‘I am a Human Being.’

He smiled. ‘Indeed.’ Muub glanced at the guards, and then turned to Toba Mixxax. ‘Citizen, what is happening here? I don’t welcome disturbances in my Hospital; we have enough to cope with without that.’

Toba bowed; he seemed to be trembling. His hands moved across the front of his body, as if he were suddenly embarrassed by his underwear. ‘Yes. I’m sorry, sir. I am Toba Mixxax; I run a ceiling-farm about thirty metres upflux, and I . . .’

‘Get on with it,’ Muub said mildly.

‘I found an injured upfluxer . . . an injured man. I brought him back. He’s in the car.’

Muub frowned. Then he slid across to the car and pulled his head and shoulders through the doorway. Dura could see the Administrator efficiently inspecting Adda. He seemed fascinated by the spears and nets of the Human Beings, the artifacts which had been used to improvise splints for Adda.

Adda opened one eye. ‘Bugger off,’ he whispered to Muub.

The Administrator studied Adda, Dura thought, as one might consider a leech, or a damaged spider.

Muub withdrew from the car. ‘This man’s seriously hurt. That right arm . . .’

‘I know, sir,’ Toba said miserably. ‘That was why I thought . . .’

‘Damn it, man,’ Muub said, not unkindly, ‘how do you expect them to be able to pay? They’re upfluxers!’

Toba dropped his head. ‘Sir,’ he said, his voice wavering but dogged, ‘there is the Market. Both the woman and the boy are strong and fit. And they’re used to hard work. I found them at the Crust, working in conditions no coolie would withstand.’ He fell silent, keeping his head averted from the others.

Muub brushed his soiled fingers against his robe and gazed vacantly into the car. At length he said mildly, ‘All right. Bring him in, Citizen Mixxax . . . Guard, help him. And bring the woman and the boy. Keep your eye on them, Mixxax; if they run wild, or foul the place, I’ll hold you responsible.’

Mixxax’s misery seemed to lift a little. ‘Yes, sir. Thank you.’

Another car sailed into the bay, evidently bringing in more patients for the Hospital; Muub Waved away, tired responsibility etched into his face.

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7

Toba grudgingly offered to let Dura and Farr stay at his home in the City while Adda's injuries were treated at the Hospital. At first Dura refused, but Toba gave her a look of exasperation. 'You haven't any choice,' he said heavily. 'Believe me. If you had, I'd tell you about it; I've got my own life to get back to, eventually . . . Look, you've nowhere to go, you've no money - not even any clothes.'

'We don't need charity.'

'The noble savage,' Toba replied sourly. 'Do you know how long it would take for you to be picked up as vagrants? You saw the guards at the Hospital. And at the Hospital, they're picked specially for their warm bedside manner. Vagrants aren't popular. *No tithes to the Committee, no room in the City*, as the saying goes . . . You'd be on a Committee-run ceiling-farm doing forced labour, or worse, before you could turn around. And then who's going to pay poor old Adda's bills?'

Dura could see there was indeed no choice. In fact, she thought, they had every reason to be grateful to this irritable little man - if he weren't offering to take them in, they could be in real difficulty. So she nodded, and tried, embarrassed, to form a phrase of thanks.

Toba said, 'Oh, just get in the car.'

Toba drove them through the still-crowded streets away from the Hospital. The streets - wood-lined corridors of varying widths - were a baffling maze to Dura, and after a few twists and corners her orientation was gone. Cars and people were everywhere, and more than once Toba's team of Air-pigs came into jostling contact with others, forcing Toba to haul on his reins. Speaker-amplified voices blared. Here in the City, Toba drove with the car door open. The Air in the streets was noisy, thick, hot, and laden with the stink of people and Air-pigs; beams of brightness shone through the dust and the green clouds of jetfart.

At length they left the busiest streets behind and came to an area which seemed quieter - less full of rushing cars and howling pigs. The corridor-streets here were wide and lined by rows of neat doors and windows which marked out small dwelling-places. Evidently these had been virtually identical when constructed, but now they had been made unique by their owners, with small plants confined in globe-baskets by the windows,

elaborate carvings on the doorways, and other small changes. Many of the carved scenes depicted the Mantle outside the City: Dura recognized vortex lines, Crust-trees, people Waving happily through clear Air. How strange that these people, still longing for the open Air, should closet themselves inside this stuffy box of wood.

Toba tugged his reins and drove the car smoothly through a wide, open portal to a place he described as a ‘car park’. He slowed the car. ‘End of the line.’ Dura and Farr stared back at him, confused. ‘Go on. Out you get. You have to Wave from here, I’m afraid.’

The car park was a large, dingy chamber, its walls stained by pig faeces and splintered from multiple collisions. There were a half-dozen cars, hanging abandoned in the Air, and thirty or forty pigs jostled together in a large area cordoned off by a loose net. The animals seemed content enough, Dura observed; they clambered slowly over each other, munching contentedly at fragments of food floating in the Air.

Toba loosened the harnesses around his own pigs and led them one by one over to the cordoned area. He guided the pigs competently through a raised flap in the net, taking care to seal the net tight after himself each time.

When he was done he wiped his hands on his short under-trousers. ‘That’s that. Someone will come by shortly to feed and scrape them.’ He sniffed, peering at the grubby walls of the car park. ‘Tatty place, isn’t it? And you wouldn’t believe the quarterly charges. But what can you do? Since the ordinances banning so much on-street parking it’s become impossible to find a place. Not that it seems to stop a lot of people, of course . . .’

Dura strained to follow this. But like much of Toba’s conversation it was largely meaningless to her, and - she suspected - contained little hard information anyway.

After a while, and with no reply from the silent, staring Human Beings, Toba subsided. He led them from the car park and out into the street.

Dura and Farr followed their host through the curving streets. It was oddly difficult to Wave here; perhaps the Magfield wasn’t as strong outside. Dura felt very conscious of people all around her, of strangers behind these oddly uniform doorways and windows. Occasionally she saw thin faces peering out at them as they passed. The stares of the people of Parz seemed

to bore into her back, and it was difficult not to whirl around, to confront the invisible threats behind her.

She kept an eye on Farr, but he seemed, if anything, less spooked than she was. He stared around wide-eyed, as if everything was unique, endlessly fascinating. His bare limbs and graceful, strong Waving looked out of place in this cramped, slightly shabby street.

After a few minutes Toba stopped at a doorway barely distinguishable from a hundred others. ‘My home,’ he explained, an odd note of apology in his voice. ‘Not as far Upside as I’d like it to be. But, still, it’s home.’ He fished in a pocket of his under-shorts and produced a small, finely carved wooden object. He inserted this into a hole in the door, turned it, and then pushed the door wide. From inside the house came a smell of hot food, the greenish light of wood-lamps. ‘Ito!’

A woman came Waving briskly to the door. She was quite short, plump and with her hair tied back from her forehead; she wore a loose suit of some brightly coloured fabric. She seemed about the same age as Dura, although - oddly - there was no yellow coloration in her hair. The woman smiled at Toba, but the smile faded when she saw the upfluxers.

Toba’s hands twisted together. ‘Ito, I’ve some explaining to do . . .’

The sharp gaze of the woman, Ito, travelled up and down the bodies of the Human Beings, taking in their bare skin, their unkempt hair, their hand-weapons. ‘Yes, you bloody well have,’ she said.

Toba’s dwelling-place was a box of wood about ten mansheights across. It was divided into five smaller rooms by light partitions and coloured sheets; small lamps, of nuclear-burning wood, glowed neatly in each room.

Toba showed the Human Beings a place to clean themselves - a room containing chutes for waste and spherical bowls holding scented cloth. Dura and Farr, left alone in this strange room, tried to use the chutes. Dura pulled the little levers as Toba had shown them, and their shit disappeared down gurgling tubes into the mysterious guts of the City. Brother and sister peered into the chutes, open-mouthed, trying to see where it all went.

When they were done Toba led them to a room at the centre of the little home. The centrepiece was a wooden ball suspended at the heart of the room; there were handholds set around the globe’s surface and fist-sized cavities carved into it. Ito - who had changed into a lighter, flowing robe - was ladling some hot, unrecognizable food into the cavities. She smiled at

them, but her lips were tight. There was a third member of the family in the room - Toba's son, who he introduced as Cris. Cris seemed a little older than Farr, and the two boys stared at each other with frank, not unfriendly curiosity. Cris seemed better muscled than most City folk to Dura. His hair was long, floating and mottled yellow, as if prematurely aged; but the colour was vivid even in the dim lamplight, and Dura suspected it had been dyed that way.

At Ito's invitation the upfluxers came to the spherical table. Dura, still naked, her knife still at her back, felt large, clumsy, ugly in this delicate little place. She was constantly aware of the Pole-strength of her muscles, and she felt inhibited, afraid to touch anything or move too quickly for fear of smashing something.

Copying Toba, she shovelled food into her mouth with small wooden utensils. The food was hot and unfamiliar, but strongly flavoured. As soon as she started, Dura found she was ravenously hungry - in fact, save for the few fragments of the bread Toba had offered to Adda during the long journey to the City, she hadn't eaten since their ill-fated hunt - and how long ago that seemed now!

They ate in silence.

After the meal, Toba guided the Human Beings to a small room in one corner of the home. A single lamp cast long shadows, and two tight cocoons had been suspended across the room. 'I know it's small, but there should be room for the two of you,' he said. 'I hope you sleep well.'

The two Human Beings clambered into the cocoons; the fabric felt soft and warm against Dura's skin.

Toba Mixxax reached for the lamp - then hesitated. 'Do you want me to dampen the light?'

It seemed a strange request to Dura. She looked around, but this deep inside Parz City there were, of course, no light-ducts, no access to the open Air. 'But then it would be dark,' she said slowly.

'Yes . . . We sleep in the dark.'

Dura had never been in the dark in her life. 'Why?'

Toba looked puzzled. 'I don't know . . . I've never thought about it.' He drew back his hand from the lamp, and smiled at them. 'Sleep well.' He Waved briskly away, sealing shut the room behind him.

Wriggling inside her cocoon, Dura uncoiled her length of rope from her waist, and wrapped it loosely around one of the cocoon's ties. She knotted the rope around her knife, close enough that she could reach the knife if she needed to. Then she squirmed deeper into the cocoon, at last drawing her arms inside it. It was an odd experience to be completely enclosed like this, though strangely comforting.

She glanced across at Farr. He was already asleep, his head tucked down against his chest. She felt a burst of protective affection for her brother - and yet, she realized ruefully, he seemed less in need of protection than she did herself. Farr seemed to be absorbing the wonders and mysteries of this complex place with much more resilience and openness than Dura could find.

Dura sighed, clinging to the fragments of her dissipating feeling of protectiveness. Looking after her brother, at least nominally, made her able to forget her own sense of isolation and threat. Perhaps in an odd way, she thought drowsily, she needed Farr more than he needed her. In the quiet of the room, she became aware of noises from beyond the walls around her. There were murmured words from Toba, the uneven voice of the boy, Cris; and then it was as if her sphere of awareness expanded out beyond this single house, so that she could hear the soft insect-murmurings of thousands of humans all around her in this immense hive of people. The wooden walls creaked softly, expanding and contracting; she felt as if the whole City were breathing around her.

The cocoon soon grew hot, confining; impatiently she shoved her arms out into the marginally cooler Air. It took her a long time to find sleep.

The next day Ito seemed a little friendlier. After feeding them again she told them, 'I've a day off work today . . .'

'Where do you work?' Dura asked.

'In a workshop just behind Pall Mall.' She smiled, looking tired at the thought of her job. 'I build car interiors. And I'm glad of a bit of free time. Sometimes, at the end of my shift, I can't seem to get the smell of wood out of my fingers . . .'

Dura listened to all this carefully. The conversation of these City folk was like an elaborate puzzle, and she wondered where to start the process of unravelling. 'What's a Pall Mall?'

Cris, the son, laughed at her. 'It's not a Pall Mall. It's just - Pall Mall.'

Ito hushed him. ‘It’s a street, dear, the main one leading from the Palace to the Market . . . All this must be very strange to you. Why don’t you come see the sights with me?’

Uncertain, Dura looked to Toba. He nodded. ‘Go ahead. I’ve got to head back to the ceiling-farm, but you take your time; it’s going to be a few days before Adda’s ready for visitors. And maybe Cris can look after Farr for a while.’

Ito was eyeing Dura’s bare limbs doubtfully. ‘But I don’t think we should take you out like that. Nudity’s all right for shock value - but in Pall Mall?’

Ito lent Dura one of her own garments, a one-piece coverall of some soft, pliant material. The cloth felt smoothly comfortable against Dura’s skin, but as she sealed up the front of the outfit she felt enclosed, oddly claustrophobic. She tried Waving around the room experimentally; the material rustled against her skin, and the seams restricted her movements.

After a little thought she wrapped her battered piece of rope around her waist, and tucked her wooden knife and scraper inside the coverall. The homely feel of the objects made her feel a little more secure.

Cris stared at her with a sceptical grin. ‘You won’t need a knife. It isn’t the upflux here, you know.’

Again Ito hushed him; the two adults politely refrained from comment.

Leaving Farr with Cris, the two women left the home with Toba. He led them to his car, waiting in the ‘car park’. Dura helped him harness up a team of fresh pigs from the pen in the corner.

Toba took them through a fresh maze of unfamiliar streets. Soon they left behind the quiet residential section and arrived in the bustling central areas. Dura tried to follow their route, but once again found it impossible. She was used to orienting herself against the great features of the Mantle: the vortex lines, the Pole, the Quantum Sea. She suspected that keeping a sense of direction while tracking through this warren of wooden corridors was a skill which the children of Parz must acquire from birth, but which she would have to spend many months learning.

Toba brought them to the widest avenue yet. Its walls - at least a hundred mansheights apart - were lined with green-glowing lamps and elaborate windows and doorways. Toba pulled the car out of the traffic streams and hauled on his reins. ‘Here you are - Pall Mall,’ he announced.

He embraced Ito. ‘I’ll head off to the farm; I’ll be back in a couple of days. Enjoy yourselves . . .’

Ito led Dura out of the car. Dura watched, uncertain, as the car pulled away into the traffic.

The avenue was the largest enclosed space Dura had ever seen - surely the largest in the City itself. It was an immense, vertical tunnel, crammed with cars and people and full of noise and light. The two women were close to one wall; Dura could see how the wall was lined with windows, all elaborately decorated and lettered, beyond which were arrays of multicoloured clothes, bags, scrapers, bottles and globes, elaborately carved lamps, finely crafted artifacts Dura could not even recognize. People - hundreds of them - swarmed across the wall like foraging animals; they chattered excitedly to each other as they plunged through doorways.

Ito smiled. ‘Shops,’ she said. ‘Don’t worry about the crush. It’s always like this.’

All four walls of the avenue were lined with the ‘shops’. The wall opposite, a full hundred mansheights away, was a distant tapestry of colour and endless human motion, rendered a little indistinct by the dusty Air; lamps sparkled in rows across its face and shafts of light shone from round ducts.

Pall Mall was alive with traffic. At first the swarming, braying cars seemed to move chaotically, but slowly Dura discerned patterns: there were several streams, she saw, moving up and down the avenue parallel to its walls, and every so often a car would veer - perilously, it seemed to her - from one stream to another, or would pull off Pall Mall into a side-street. The Air was thick with green jetfart, alive with the squealing of pigs. For a while Dura managed to follow Toba’s car as it worked its way along the avenue, but she soon lost it in the swirling lanes of traffic.

There was a strong, sweet smell, almost overpowering. It reminded Dura of the scented towels in Ito’s bathroom.

Ito, touching her arm, drew her towards the shops. ‘Come on, dear. People are starting to stare . . .’

Dura could hardly help goggle at the people thronging the shops. Men and women alike were dressed in extravagantly coloured robes and coveralls shaped to reveal flashes of flesh; there were hats and jewels everywhere, and hair sculpted into huge, multicoloured piles.

Ito led Dura through two or three shops. She showed her jewellery, ornaments, fine hats and clothes; Dura handled the goods, wondering at the fine craftsmanship, but quite unable to make sense of Ito's patient explanations of the items' use.

Ito's persistence seemed to be wearing a little now, and they returned to the main avenue. 'We'll go to the Market,' Ito said. 'You'll enjoy that.'

They joined a stream of people heading - more or less - for that end of Pall Mall deepest inside the City. Almost at once Dura was thumped in the small of her back by something soft and round, like a weak fist; she whirled, scrabbling ineffectually at her clothes in search of her knife.

A man hurried past her. He was dressed in a flowing, sparkling robe. In his soft white hands he held leaders to two fat piglets, and he was being dragged in an undignified way - it seemed to Dura - after the piglets, his feet dangling through their clouds of jetfart. It had been one of the piglets that had hit Dura's back.

The man barely glanced at her as he passed.

Ito was grinning at her.

'What's wrong with him? Can't he Wave like everyone else?'

'Of course he can. But he can afford not to.' Ito shook her head at Dura's confusion. 'Oh, come on, it would take too long to explain.'

Dura sniffed. The sweet smell was even stronger now. 'What *is* that?'

'Pig farts, of course. Perfumed, naturally . . .'

They dropped gently down the avenue, Waving easily. Dura found herself embarrassed by the awkward silences between herself and this kindly woman - but there was so little common ground between them.

'Why do you live in the City?' Dura asked. 'I mean, when Toba's farm is so far away . . .'

'Well, there's my own job,' Ito said. 'The farm is large, but it's in a poor area. Right on the fringe of the hinterland, so far upflux that it's hard even to get coolies to work out there, for fear of . . .' She stopped.

'For fear of upfluxers. It's all right.'

'The farm doesn't bring in as much as it should. And everything seems to cost so much . . .'

'But you could live in your farm.' The thought of that appealed to Dura. She liked the idea of being out in the open, away from this stuffy warren - and yet being surrounded by an area of cultivation, of *order;* to know that

your area of control extended many hundreds of mansheights all around you.

‘Perhaps,’ Ito said reluctantly. ‘But who wants to be a subsistence farmer? And there’s Cris’s schooling to think of.’

‘You could teach him yourself.’

Ito shook her head patiently. ‘No, dear, not as well as the professionals. And they are only to be found here, in the City.’ Her tired, careworn look returned. ‘And I’m determined Cris is going to get the best schooling we can afford. *And* stick it to the end, despite his dreams of Surfing.’

Surfing?

Dura fell silent, trying to puzzle all this out.

Ito brightened. ‘Besides - with all respect to you and your people, dear - I wouldn’t want to live on some remote farm, when I could be surrounded by all this. The shops, the theatres, the libraries at the University . . .’ She looked at Dura curiously. ‘I know this is all strange to you, but don’t you feel the buzz of life here? And if, one day, we could move a bit further Upside . . .’

‘Upside?’

‘Closer to the Palace.’ Ito pointed upwards, back the way they had come. ‘At the top of the City. All of this side of the City, above the Market, is Upside.’

‘And below the Market . . .’

Ito blinked. ‘Why, that’s the Downside, of course. Where the Harbour is, and the dynamo sheds, and cargo ports, and sewage warrens.’ She sniffed. ‘*Nobody* would live down there by choice.’

Dura Waved patiently along, the unfamiliar clothes scraping across her legs and back.

As they descended, the walls of Pall Mall curved away from her like an opening throat, and the avenue merged smoothly into the Market. This was a spherical chamber perhaps double the width of Pall Mall itself. The Market seemed to be the endpoint of a dozen streets - not just the Mall - and traffic streams poured through it constantly. Cars and people swarmed over each other chaotically; in the dust and noise, Dura saw drivers lean out of their cars, bellowing obscure profanities at each other. There were shops here, but they were just small, brightly coloured stalls strung in rows across

the chamber. Stallkeepers hovered at all angles, brandishing their wares and shouting at passing customers.

At the centre of the Market was a wheel of wood, about a mansheight across. It was mounted on a huge wooden spindle which crossed the chamber from side to side, cutting through the shambolic stalls; the spindle must have been hewn from a single Crust-tree, Dura thought, and she wondered how the carpenters had managed to bring it here, into the heart of the City. The wheel had five spokes, from which ropes dangled. The shape of the wheel looked vaguely familiar to Dura, and after a moment's thought she recalled the odd little talisman which Toba wore around his neck, the man spreadeagled against a wheel. Wasn't that five-spoked too?

Ito said, 'Isn't this great? These little stalls don't look like much but you can get some real bargains. Good quality stuff, too . . .'

Dura found herself backing up, back towards the Mall they'd emerged from. Here, right in the belly of this huge City, the noise, heat and constant motion seemed to crowd around her, threatening to overwhelm her.

Ito followed her and took her hand. 'Come on,' she said. 'Let's find somewhere quieter and have something to eat.'

Cris's room was a mess. Crumpled clothes, all gaudily coloured, floated through the Air like discarded skin; from among the clothes' empty limbs, bottles of hair-dye protruded, glinting in the lamplight. Cris pushed his way confidently into this morass, shoving clothes out of the way. Farr didn't find it so easy to enter the room. The cramped space, the clothes pawing softly at his flesh, gave him an intense feeling of claustrophobia.

Cris misread his discomfiture. 'Sorry about the mess. My parents give me hell about it. But I just can't seem to keep all this junk straight.' He tipped back in the Air and rammed at a mass of clothing with both feet; the clothing wadded into a ball and compressed into one corner, leaving the Air marginally clearer; but even as Farr watched the clothes slowly unravelled, reaching out blindly with empty sleeves.

Farr peered around, wondering what he was supposed to say. 'Some of your belongings are - attractive.'

Cris gave him an odd look. 'Attractive. Yeah. Well, not half as attractive as they could be if we had a little more money to spare. But times are hard. They're always hard.' He dived into the bundles of clothing once more,

pulling them apart with his hands, evidently searching for something. ‘I suppose money doesn’t mean a thing, where you grew up.’

‘No,’ Farr said, still unsure what money actually was. Oddly, he had heard envy in Cris’s voice.

Cris had retrieved something from within the cloud of clothing: a board, a thin sheet of wood about a mansheight long. Its edges were rounded and its surface, though scored by grooves for gripping, was finely finished and polished so well that Farr could see his reflection in it. A thin webbing of some shining material had been inlaid into the wood. Cris ran his hand lovingly over the board; it was as if, Farr thought, he were caressing the skin of a loved one. Cris said, ‘It sounds great.’

‘What does?’

‘Life in the upflux.’ Cris looked at Farr uncertainly.

Again Farr didn’t know how to answer. He glanced around at Cris’s roomful of possessions - none of which he’d made himself, Farr was willing to bet - and let his look linger on Cris’s stocky, well-fed frame.

‘I mean, you’re so *free* out there.’ Cris ran his hand around the edge of his polished board. ‘Look, I finish my schooling in another year. And then what? My parents don’t have the money for more education - to send me to the University, or the Medical College, maybe. Anyway, I don’t have the brains for any of that.’ He laughed, as if proud of the fact. ‘For someone like me there are only three choices here.’ He counted them off on his callus-free fingers. ‘If you’re stupid, you end up in the Harbour, fishing up Corestuff from the underMantle - or maybe you can lumberjack, or you might end up in the sewage runs. Whatever. But if you’re a little smarter you might get into the Civil Service, somewhere. Or - if you can’t stand any of that, if you don’t want to work for the Committee - you can go your own way. Set up a stall in the Market. Or work a ceiling-farm, like my father, or build cars like my mother. And spend your life breaking your back with work, and paying over most of your money in tithes to the Committee.’ He shrugged, clinging to his board; his voice was heavy with despondency, with world-weariness. ‘And that’s it. Not much of a choice, is it?’

If Farr had closed his eyes he might have imagined he was listening to an old, time-beaten man like Adda rather than a boy at the start of his life. ‘But at least the City keeps you fed, and safe, and comfortable.’

‘But not everyone wants to be comfortable. Isn’t there more to life than that?’ He looked at Farr again with that odd tinge of envy. ‘That’s what Surfing offers me . . . Your life, in the upflux, must be so - *interesting*. Waking up in the open Air, every day. Never knowing what the day is going to bring. Having to go out and find your own food, with your bare hands . . .’ Cris looked down at his own smooth hands as he said this.

Farr didn’t know what to reply to all this. He had come to think of the City folk as superior in wisdom, and it was a shock to find one of them talking such rubbish.

Looking for something to say, he pointed to the board Cris was still cradling. ‘What’s this?’

‘My board. My Surfboard.’ Cris hesitated. ‘You’ve never seen one before?’

Farr reached out and ran his fingertips over the polished surface. It was worked so finely that he could barely feel the unevenness of the wood; it was like touching skin - the skin of a very young child, perhaps. The mesh of shining threads had been inlaid into a fine network of grooves, just deep enough to feel.

‘It’s beautiful.’

‘Yes.’ Cris looked proud. ‘It’s not the most expensive you can get. But I’ve put a hell of a lot of work into it, and now I doubt there’s a better board this side of Pall Mall.’

Farr hesitated, embarrassed by his utter ignorance. ‘But what’s it for?’

‘For Surfing.’ Cris held the board out horizontally and flipped up into the Air, bringing his bare feet to rest against the ridged board. The board drifted away from him, of course, but Farr could see how expertly Cris’s feet moved over the surface, almost as if they were a second pair of hands. Cris held his arms out and swayed in the Air. ‘You ride along the Magfield, like this. There’s nothing like it. The feeling of power, of speed . . .’

‘But how? Do you Wave?’

Cris laughed. ‘No, of course not.’ Then he looked more thoughtful. ‘At least, not quite.’ He flipped off the board, doing a neat back-somersault in the cramped room, and caught the board. ‘See the wires inlaid into the surface? That’s Corestuff. Superconducting. That’s what makes the boards so damn expensive.’ He rocked the board in the Air with his arms. ‘You work it like this, with your legs. See? It’s like Waving, but with the board

instead of your body. The currents in the superconductors push against the Magfield, and . . .' He shot his hand through the Air. 'Whoosh!'

Farr thought about it. 'And you can go faster than Waving?'

'Faster?' Cris laughed again. 'You can be faster than any car, faster than any farting pig - when you get a clear run, high above the Pole, you feel as if you're going faster than thought.' His expression turned misty, dreamlike.

Farr watched him, fascinated and curious.

'So that's what the board is for . . . sort of. But it's also my way out of here. Out of my future. Maybe.' Cris seemed awkward now, almost shy. 'I'm good at this, Farr. I'm one of the best in my age group; I've won a lot of the events I've been eligible for up to now. And in a couple of months I qualify for the big one. The Games. I'll be up against the best, my first chance . . .'

'The Games?'

'The biggest. If you do well there, become a star of the Games, then Parz just opens her legs for you.' Cris laughed coarsely at that, and Farr grinned uncertainly. 'I mean it,' Cris said. 'Parties at the Palace. Fame.' He shrugged. 'Of course it doesn't last forever. But if you're good enough you never lose it, the *aura*. Believe me . . . Will you still be around, for the Games?'

'I don't know. Adda . . .'

'Your friend in the Hospital. Yeah.' Cris's mood seemed to swing to embarrassment again. 'Look, I'm sorry for going on about Surfing. I know you're in a difficult situation.'

Farr smiled, hoping to put this complex boy at his ease. 'I enjoy hearing you talk.'

Cris studied Farr speculatively. 'Listen, have you ever tried Surfing? No, of course you haven't. Would you like to? We could meet some people I know . . .'

'I don't know if I'd be able to.'

'It looks simple,' Cris said. 'It *is* simple in concept, but difficult to do well. You have to keep your balance, keep the board pressed between you and the Magfield, keep pushing down against the flux lines to build up your speed.' He closed his eyes briefly and rocked in the Air.

'I don't know,' Farr said again.

Cris eyed him. ‘You should be strong enough. And, coming from the upflux, your sense of balance and direction should be well developed. But maybe you’re right. You’re barrel-chested, and your legs are a little short. Even so it mightn’t be impossible for you to stay aboard for a few seconds . . .’

Farr found himself bridling at this cool assessment. He folded his arms. ‘Let’s do it,’ he said. ‘Where?’

Cris grinned. ‘Come on. I’ll show you.’

Ito took Dura to the Museum.

This was situated in the University area of the City - far Upside, as Dura was learning to call it; in fact, not very far below the Palace itself. The University was a series of large chambers interconnected by richly panelled corridors. Ito explained that they weren’t allowed to disturb the academic calm of the chambers themselves, but she was able to point out libraries, seminar areas filled with groups of earnest young people, arrays of small cells within which the scholars worked alone, poring over their incomprehensible studies.

The University was close to the City’s outer wall, and was so full of natural light the Air seemed to glow. There was an atmosphere of calm here, an intensity which made Dura feel out of place (even more than usual). They passed a group of senior University members; these wore flowing robes and had shaved off their hair, and they barely glanced at the two women as they Waved disdainfully past.

She leaned close to Ito and whispered, ‘Muub. That Administrator at the Hospital. He shaved his head. Does he belong here too?’

Ito smiled. ‘I’ve never met the man; he sounds a little too grand for the likes of us. But, no, if he works at the Hospital he has no connection now with the University. But he may once have studied here, and he wears the bald fashion as a reminder to the rest of us that once he was a scholar.’ Her smile was thin, Dura thought, and tired-looking. ‘People do that sort of thing, you know.’

‘Did you - study - at the University? Or Toba?’

‘Me?’ Ito laughed, gently. ‘Do I look as if I could ever have afforded it? . . . It would be wonderful if Cris could make it here, though. If only we could find the fees - it would give him something higher, something better

to aim for. Maybe he wouldn’t waste so much time on that damn Surfboard.’

The Museum was a large cube-shaped structure at the heart of the University complex. It was riddled with passageways and illumination shafts, so that light seeped through the whole of its porous bulk. As they moved slowly through the maze of passageways, the multitude of ports and doorways seemed to conceal a hundred caches of treasure.

One corridor held rows of pigs, rays and Crust-spiders. At first the creatures, looming out of the darkness, made Dura recoil; but she soon realized that these animals were no threat to her - and never would be to anyone else. They were dead, preserved somehow, fixed to the walls of this place in grim parodies of their living postures: gazing at the magnificent, outstretched wings of a ray, pinned against a frame of wood, Dura felt unaccountably sad. A little further along a display showed an Air-pig - dead like the others, but cut open and splayed out with its organs - small masses of tissue fixed to the inner wall of the body - now glistening, exposed for her inspection. Dura shuddered. She had killed dozens of Air-pigs, but she could never have brought herself to touch this cold, clean display.

Oddly, there was no smell in these corridors, either of life or death.

They came to an area containing human artifacts. Much of it was from the City itself, Dura gathered, but from ages past; Ito laughed as she pointed to clothes and hats mounted on the walls. Dura smiled politely, not really seeing the joke. There was a model of the City, finely carved of wood and about a mansheight tall. There was even a lamp inside so that the model was filled with light. Dura spent some time peering at this in delight, with Ito pointing out the features of the City. Here was a toy lumber train entering one of the great ports Downside, and here was the Spine leading down into the underMantle; tiny cars carrying model Fishermen descended along the Spine, seeking lodes of precious Corestuff. And the Palace at the very crown of the City - at the farthest Upside of all - was a rich tapestry glowing with life and colour.

Further along, there were small cases containing artifacts from outside the City. Ito touched her arm. ‘Perhaps you’ll recognize some of this.’ There were spears, and knives, all carved from wood; she saw nets, ponchos, lengths of rope.

Upfluxer artifacts.

None of them looked as if they had come from the Human Beings themselves. But, said Ito, that wasn't so surprising; there were upfluxer bands all around the fringe of Parz's hinterland, right around the Star's Polar cap. Dura studied the objects, aware of her own knife, her rope still wrapped around her waist. The things she carried wouldn't be out of place inside one of these displays, she realized. With a tinge of bitterness, she wondered if these people would like to pin her and her brother up on the walls, like that poor, dead ray.

Finally, Ito brought her to the Museum's most famous exhibit (she said). They entered a spherical room perhaps a dozen mansheights across. The light here was dim, coming only from a few masked wood-lamps, and it took some time for Dura's eyes to adapt to the darkness.

At first she thought there was nothing here, that the chamber was empty. Then, slowly, as if emerging from mist, an object took shape before her. It was a cloud about a mansheight across, a mesh of some shining substance. Ito encouraged her to move a little closer, to push her face closer to the surface of the mesh. The exhibit was like a tangled-up net, composed of cells perhaps a handsbreadth across. And Dura saw that within the cells of the main mesh there was more detail: sub-meshes, composed of fine cells no wider than a hair-tube. Perhaps, Dura wondered, if she could see well enough she would find still more cells, almost invisibly tiny, within the hair-scale mesh.

Ito showed Dura a plaque on the wall, inscribed with text on the display. '"The structure is *fractal*."' Ito pronounced the word carefully. '"That is, it shows a similar structure on many scales. Corestuff lends itself to this property, being composed of hyperons, bags of quarks in which are dissolved the orderly nucleons - the protons and neutrons - of the human world.

'"In regions humans can inhabit Corestuff exists in large metastable islands of matter - the familiar Corestuff bergs retrieved by Fishermen, and used to construct anchor-bands, among other artifacts . . .

'"But further in, in the deep Core, the hyperonic material can combine to form extraordinary, rich structures like this model. The representation here is based on guesswork - on fragmentary tales from the time of the Core Wars, and on half-coherent accounts of Fishermen. Nevertheless, the University scholars feel that . . ."'

‘But,’ Dura interrupted, ‘what *is* it?’

Ito turned to her, her face round and smooth in the dim light. ‘Why, it’s a Colonist,’ she said.

‘But the Colonists were human.’

‘No,’ Ito said. ‘Not really. They abandoned us, stealing our machines, and went down into the Core.’ She looked sombre. ‘And this is what they became. They lived in these structures of Corestuff.’

Dura stared into the deep, menacing depths of the model. It was as if, here in the belly of the City, she had been transported to the Core itself and left to face this bizarre, monstrous entity alone.

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8

Clutching his Surfboard, Cris led Farr through the heart of the City.

They followed a tangle of subsidiary streets, avoiding the main routes. Farr tried to memorize their path, but his rudimentary sense of City-bound direction was soon overwhelmed. Lost, baffled, but following Cris doggedly, he involuntarily glanced around, looking for the Quantum Sea, the angle of the vortex lines to orient himself. But of course, here deep in the guts of Parz, the faceless wooden walls hid the world.

After a time, though, he realized that they must have passed below the City's rough equator and moved into the region called the Downside. The walled streets here were meaner, with illumination shafts and wood-lamps far separated. There were few cars and fewer Wavers, and the doors to dwelling-places off the Downside streets, battered and dirty, looked impenetrably solid. Cris didn't comment on the changed environment - he kept up his chatter of Surfing as if oblivious - but Farr noticed how the City boy kept his precious board clutched tight against his chest, shielding it with his body.

At length they came to a wide, oval port set in a street wall. The shaft beyond this port, about ten mansheights across, was much plainer than any City street - long and featureless, and with scuffed, unfinished-looking walls - but it led, Farr saw, to an ellipse of clear, precious Airlight. He stared hungrily into that light, marvelling at how the bright yellow glow glittered from scraped-smooth patches of wall.

'Are we going down here?'

'Through this cargo port? Out through the Skin? But that's against City ordinances . . .' Cris grinned. 'You bet we are.' With a whoop, Cris placed one hand on the lip of the elliptical entrance and somersaulted into the shaft. His board clutched above his head, he flapped his arms, Waving in reverse feet-first down the shaft. Farr, clumsier, clambered over the lip of the port and plunged down. Laughing, their voices echoing from the wooden walls, the boys tumbled towards the open Air.

Farr shot out of the oppressive wall of the City and spread his arms and legs, drinking in the yellow-shining Air and staring up at the arc of the vortex lines.

Cris was looking at him sceptically. 'Are you okay?'

‘I’m just glad to be out in the Air . . . even if it *is* this sticky Polar stuff.’

‘Right. Not like back in the good old upflux, eh?’ Cris levelled his board, flexed it with the palm of his hand experimentally against the Magfield.

Farr rolled luxuriously in the Air. The port they’d emerged from was a rough-rimmed mouth set in the wooden outer hull - the *Skin* - and it loomed around them still, as if threatening to snap down on them, to swallow them back into the City’s wooden guts. But the boys were drifting in the Air, away from the City, and Farr saw that this port was just one of an array of similar entrances which stretched across the face of the City in all directions, as far as he could see. Farr tried to pick out identifying features of ‘their’ port, so he could find it again if he needed to. But it was simply a crudely finished gash in the wooden Skin, unmarked, with nothing to distinguish it from a hundred others. Farr soon gave up the effort of memorizing. After all, if he did get lost, even if he found this particular port again he’d never find his way back to the Mixxaxes’ home through the City streets.

He flipped his legs and pulled a little further away from the City. The Skin was like a gigantic mask, looming over him. This close he could see its detail - how it was crudely cobbled together from mismatched sections of wood and Corestuff - but it was hugely impressive nevertheless. The dozens of cargo ports in this part of the Skin were, he thought, like mouths, continually ingesting; or perhaps like capillary pores, taking in a granular Air of wood and food. As he pulled back still further he saw the huge, unending falls from the sewage outlets spread across the base of the City; the roar of the semisolid stuff tumbling into the underMantle seemed to fill the Air.

The City - battered and imperfect as it might be - was magnificent, he realized slowly; it was like an immense animal, noisily alive, utterly oblivious of his own tiny presence before its face.

He heard his name called.

He glanced around, but Cris had gone. Farr felt an absurd stab of disorientation - after all, he had a far smaller chance of getting lost out here than in the City’s guts - and twisted, staring around. There was Cris, his orange coverall bright, a distant, waving figure suspended on his Surfboard.

He was close to the Skin but far above Farr's head. He'd slipped away while Farr was daydreaming.

Embarrassed, a little irritated, Farr thrust at the Air, letting the upfluxer strength in his legs hurl him towards Cris.

Cris watched him approach, grinning infuriatingly. 'Keep up. There are people waiting for us.' He clambered back onto his board, turned and led the way.

Farr followed, perhaps a mansheight behind; one after the other the boys soared over the face of the City.

Cris's Surfing technique was spectacular, bearing little relation to the cut-down caricature he had shown Farr inside the City. Cris pivoted the gleaming board under one bare foot while thrusting with the other heel at the back of the board, making it Wave vigorously. His bare soles seemed able to grip at the surface's fine ridges. He kept his arms stretched out in the Air for balance, and the muscles in the City boy's legs worked smoothly. The whole process looked wonderfully easy, in fact, and Farr felt a dull itch - in the small of his back and in his calves - as he stared at Cris. He longed to try out the Surfboard for himself. Why, with his enhanced strength, here at the Pole, he could make the damn thing *fly* . . .

But he couldn't deny Cris's skill as he expertly levered his mass and inertia against the soft resistance of the Magfield. The speed and grace of Cris's motion, with electron gas crackling around the Corestuff strips embedded in the board, was nonchalant and spectacular.

They were climbing up and around the City's Skin, generally away from the sewage founts at the base but on a diagonal line across the face. They crossed one of the huge Longitude anchor-bands. Farr saw how the band was fixed to the Skin by pegs of Corestuff at intervals along its length. The gleaming Corestuff strip was wider than a mansheight, and - in response to the huge currents surging through the band's superconducting core - electron gas played unceasingly over its smooth surface. The Magfield here was distorted, constricted by the band's field; it felt uneven, harsh, tight around Farr's chest.

Cris clambered off his board and joined Farr in Waving away from the Skin, working cautiously past the anchor-band. 'Magfield's too spiky here,' Cris said curtly. 'You can't get a proper grip.'

Past the anchor-band, the Skin unfolded before Farr's gaze. He'd expected the Skinscape to be featureless, uniform, except for the random blemishes of its construction. But it was much too huge to allow such uniformity, he soon realized. As they climbed towards the City's equator, towards the Upside areas, the huge cargo ports and public Air-shafts became more sparse, to be replaced by smaller, tidier doorways evidently meant for humans and Air-cars, and by small portals which must be windows or light-shafts for private dwellings. A man leaned out of a window and hurled out a bowl of what looked like sewage; the stuff sparkled as it dispersed. Cris cupped his hands around his mouth and called down a greeting. The man - squat and yellow-haired - peered out into the sky, startled. When he spotted the boys he shook his fist at them, shouting something angry but indistinguishable. Cris yelled abuse back, and Farr joined in, shaking his fist in return. He laughed, exhilarated by this display of disrespect; he felt free, young, healthy, released from the confines of the City, and the comparison with the sour old man in his windowed cell made his condition all the sweeter.

They flew past an area of hull covered by a crude framework, a rectangular lattice of wood. Behind the framework the Skin was broken open, exposing small chambers within the City lit by dim green wood-lamps. Huge sections of wooden panelling drifted in the Air outside the City, attached loosely to the framework by lengths of rope; men and women clambered over the framework, hauling at the panels and hammering them into place in the gaps in the Skin.

'Repairs,' said Cris in uninterested response to Farr's question. 'They go on all the time. My father says the City's never really been finished; there's always some section of it that needs rebuilding.'

They arced high across a comparatively blank area of hull, unblemished by door, window or port. Farr looked back to see the last small portals recede over the City's tightly curving horizon, and soon there was no break in the Skin in sight. Cris Surfed on in silence, subdued. Moving over this featureless Skinscape Farr felt absurdly as if he had been rejected by the City, thrown out and shunned - as if it had turned its back.

Now they passed another group of humans clambering over the Skin. At first Farr thought this must be another set of repair workers, but the Skin here was unbroken, clearly undamaged. And there was no repair scaffolding

- just a loose net spread across the Skin. A group of perhaps twenty adults were huddled in one corner of their net, engaged in some unidentifiable project. Peering down as they passed, Farr saw how belongings had been stuffed loosely into the net; he saw spears, crude clothing and smaller folded-up nets that wouldn't have seemed out of place among the belongings of the Human Beings. There was even a small colony of Air-pigs which jostled slowly against the wooden wall, bound by ropes to a peg which had been hammered into the Skin. An infant child squirmed inside the net, crying; its wails, sweet and distant, carried through the silent Air to Farr.

A woman, fat and naked, turned from whatever she was engaged in with her companions, and peered up at the boys. Farr saw how her fists were clenched. He looked to Cris for a lead, but the City boy simply Waved on with his board, keeping his eyes averted from the little colony below.

Farr, burning with curiosity, glanced down again. To his relief he saw that the woman had turned away and was returning to her companions, evidently forgetting the boys.

'Skin-riders,' Cris said dismissively. 'Scavengers. There are whole colonies of them, living off remote bits of the Skin like this.'

'But how do they survive?'

'They take stuff from the sewage founts, mostly. Filter it out with those nets of theirs. Some of it they consume themselves, and some they use to feed their pigs. Many of them hunt.'

'Doesn't anybody mind?'

Cris shrugged. 'Why should they? The Skin-riders are out of the way in places like this, and they don't absorb any of the City's resources. You could say they make Parz more efficient by extracting what they can out of everyone else's waste. The Committee only takes action against them when they go rogue. Turn bandit. Some tribes do, you know. They ring the exit portals, waiting to descend on slower-moving cars. They kill the drivers and steal the pigs; they've no use for the cars themselves. And sometimes they turn on each other, fighting stupid little Skin-wars no one else understands. *Then* the guards step in. But apart from that, I guess the City is big enough to support a few leeches on its face.' He grinned. 'Anyway, there'll always be Skin-riders; you could never wipe them out. Not everyone can live their lives inside six wooden walls.' He bent his knees, flourishing the board.

‘Which is one reason I’m out here today. I’d have thought you’d understand that, Farr. Maybe the Skin-riders are a little like your people.’

Farr frowned. Maybe there was a surface comparison, he thought. But Human Beings would never allow themselves to become so - so filthy, he thought, so poor, to live so badly - as the Skin-riders he had seen.

And no Human Being would accept the indignity of living by scavenging the waste of others.

The squalid little colony of Skin-riders was soon hidden by the wooden limb of the City face, and Cris led Farr further across the featureless Skin.

Farr spotted the girl before Cris saw her.

She was a compact, lithe shape swooping around the vortex lines, high above the City. Electron gas sparkled around her Surfboard, underlighting the contours of her body. There was a grace, a naturalness about her movements which far eclipsed even Cris’s proficiency, Farr thought. The girl saw them approaching and waved her arms in greeting, shouted something inaudible.

They came to another net, stretched over the wooden Skin between a series of pegs, just as the Skin-riders’ had been. But this net was evidently abandoned: torn and fraying, the net flapped emptily, containing nothing but what looked like the sections of a Surfboard snapped in half, a few clothes tucked behind knots in the net, and some crude-looking tools.

Cris drifted to a halt over the net and locked an anchoring hand comfortably into a loop of rope. ‘That’s Ray,’ he said enviously. ‘The girl. That’s what she calls herself anyway . . . after the rays of the Crust-forests, you see.’

Farr squinted up at the girl; she was spiralling lazily around a vortex line as she approached them, electron glow dazzling from her skin. ‘She looks good.’

‘She is good. Too bloody good,’ Cris said with a touch of sourness. ‘And she’s a year younger than me . . . My hope is there’s going to be room for both of us in the Games.’

‘What is this place?’

Cris flipped his Surfboard in the Air and watched it somersault. ‘Nowhere,’ he said. His voice was deliberately casual. ‘Just an old Skin-rider net, in a bit of the Skinscape that’s hardly ever visited. We just use it

as a base. You know, a place to meet, to Surf from, to keep a few tools for the boards.'

Just a *base to Surf from* . . . Cris's tone made it sound a lot more important than that, to him. Farr watched the girl approach, casually skilful, slowing as she rode the Magfield towards the Skin. He thought of what it must be like to be accepted by a group of people like Cris and this girl Ray - to have a place like this to come to, hidden from the gaze of families and the rest of the City.

He could barely imagine it. He realized suddenly that he'd never even been out of sight of his family before the Glitch that killed his father. A place like this must mean a great deal.

He wanted to ask Cris more questions. Who were these Surfers? What were they like? How many of them were there? . . . But he kept quiet. He didn't want to be the clumsy outsider from the upflux - not here, not with these two. He wanted them to accept him, to make him one of theirs - even just for a day.

Maybe if he kept his mouth shut as much as possible they would think he knew more than he did.

The girl, Ray, performed one last roll through the Air and stepped lightly off her board before them. With one small ankle she flipped the board up, caught it in one hand, and tucked it into a gap in the net. She hooked a hand into the net, close to Cris's, and smiled at him and Farr. She was nude, and her long hair was tied back from her face; there were streaks of yellow dye across her scalp, just as Cris affected.

'You're on your own today?' Cris asked.

She shrugged, breathing heavily. 'Sometimes I prefer it that way. You can get some real work done.' She turned to Farr, a look of lively interest on her face. 'Who's this?'

Cris grinned and clapped a hand on Farr's shoulder. 'He's called Farr. He's staying with us. He's from a tribe called the Human Beings.'

'Human Beings?'

'Upfluxers,' Cris said with an apologetic glance at Farr.

The girl's smile broadened, and Farr was aware of her light gaze flicking over him with new interest. 'An upfluxer? Really? So what do you make of Parz? Dump, isn't it?'

Farr tried to find something to say.

He couldn’t take his eyes off the girl. Her face was broad, intelligent, vividly alive, her perfect nostrils shining. She was still breathing deeply after her exertions, and her chest and shoulders were rising and falling smoothly. The capillary pores across her chest and between her small breasts were wide and dark.

Cris was staring at him strangely, and Ray was watching him, interested, amused. He had to find something to say. ‘It’s okay. Parz is fine. Interesting.’ *Interesting*. What a stupid thing to say. His voice sounded booming and uncontrolled, and he was aware of his bulky, overmuscled body, his hands huge and useless at his side.

She let herself drift a little closer to him. He tried to keep his eyes on her face. Her nakedness was spectacular. But that didn’t make sense; the Human Beings had always gone naked, save for occasional toolbelts or ponchos, so why should he be so disturbed now? He must have become accustomed to bodies hidden by City clothes, like the light coveralls he and Cris were wearing; Ray’s sudden nudity by contrast was impossible to ignore. Yes, that must be it . . .

But now he felt a deep warmth in his lower belly. *Oh, blood of the Xeelee, help me*. Like an independent creature - utterly without his volition - his penis was trying to push out of its cache. He leaned forward, hoping that folds in the cloth of his coveralls would hide him. But the girl’s eyes were wide and appraising, and he could see a smile forming on her small mouth. *She knew*. She knew all about him.

‘“Interesting”,’ she repeated. ‘Maybe, if you haven’t had to grow up in it.’

‘We saw you practising,’ Cris said. ‘You’re looking good.

‘Thanks.’ She looked at Cris awkwardly. ‘I’ve been selected for the Games. Had you heard that?’

‘Already?’ Farr could see envy battling with affection for the girl on Cris’s face. ‘No, I - I mean, I’m pleased for you. Really, I am.’

She brushed Cris’s shoulder with her fingertips. ‘I know. And it’s not too late for you.’ She took her board from the net. ‘Come on, let’s practise.’

Cris glanced at Farr. ‘Yes, soon. But first . . .’ He held out his board to Farr. ‘Would you like to try it?’

Farr took the board hesitantly. He ran the palm of his hand across its surface. The wood was more finely worked than any object he’d ever held,

and the inlaid strips of Corestuff were cold and smooth. ‘Don’t you mind?’

Cris laughed easily. ‘As long as you bring it back whole, no. Go with Ray - she’s a better Surfer than me, and a better teacher. I’ll wait here until you’re done.’

Farr looked at Ray. She smiled at him. ‘Come on, it’ll be fun.’ She took the board from him - her fingers brushed the back of his hand, lightly, sending a thrill through him which caused his penis to stir again - and laid the board along the Magfield, flat. She patted its surface with its criss-cross inlay of Corestuff strips. ‘Surfing’s easy. It’s just like Waving, but with your feet and your board instead of your legs. All you have to remember is to keep contact with your board, to keep pushing against the Magfield . . .’

With Ray’s help, and Cris’s, Farr clambered onto the board and learned how to rock it with his toes and heels. At first it seemed impossible - he kept kicking the board away, clumsily - and he was aware of the eyes of Ray on every galumphing movement. But each time he fell away he retrieved the board and climbed back on.

Then, suddenly, he had it. The secret was not strength, really, but gentleness, suppleness, a sensitivity to the soft resistance of the Magfield. It was enough to rock the board steadily and evenly across the Magfield flux paths, to keep the pressure of his feet less than the counterpressure of the Magfield so that the board stayed attached to the soles of his bare feet. When a downstroke with one foot was completed, he bent his legs slowly and pushed the other end of the board down in its turn. Gradually he learned to build up the tempo of this rocking motion, and wisps of electron gas curled about his toes as induced current began to flow in the Corestuff inlays.

The board - Waving just as the girl had said - carried him gracefully, effortlessly across the flux lines.

He learned to slow, to turn, to accelerate. He learned when to stop rocking the board, simply to allow his momentum to carry him arcing across the Magfield.

He had no idea how long it took him to learn the basics of Surfing. He was only peripherally aware of Cris’s continuing patience, and he even forgot, for quite long periods, the nearness of Ray’s bare, lithe body. He sailed across the sky. It was, he thought, like learning to Wave for the first time. The board felt natural beneath his feet, as if it had always been there,

and he suspected that a small, inner part of him - no matter what he did or where he went - would always cling to the memory of this experience, utterly addicted.

Ray swooped down before him, inverted and with hands on bare hips. ‘All right,’ she said. ‘You’ve got the basics. Now let’s *really* Surf. Come on!’

High over the Pole, Farr surged along the corridors of light marked out by hexagonal arrays of vortex lines. The lines surged past him with immense, unimaginable speed. The soft bodies of floating spin-spider eggs padded at his face and legs as he flew, and the Air brushed at his cheeks, the tiny viscosity of its non-superfluid component resisting him feebly. The Quantum Sea was a purple floor far below him, delimiting the yellow Air; and the City was a vast, complex block of wood and light, hanging over the Pole, huge yet dwarfed by the Mantlescape.

Ahead of him the girl Ray looped around vortex lines with unconscious skill, electron light shimmering from her calves and buttocks.

His face was stretched into a fierce grin. He knew the grin was there, he knew Ray must be able to see it, and yet he couldn’t keep it from his face. Surfing was *glorious*. His head rattled with the elements of complex, unrealistic schemes by which he might acquire his own board, join this odd, irregular little troupe of Skin-based Surfers, maybe even enter some future Games himself.

Ray turned and swept close to him. ‘You’re doing fine,’ she shouted.

‘I still feel as if I might fall off any moment.’

She laughed. ‘But you’re strong. That makes up for a lot. Come on. Try a spiral.’

She showed him how to angle his body back and push the board across the Magfield, so that he moved in slow, uneven, sweeping curves around a vortex line. Still he was hurtling forward through the sky, but now the huge panorama wheeled steadily around him. He stared down at his body, at the board; blue highlights from the corridors of vortex lines and the soft purple glow of the Sea cast complex shadows across his board.

He pushed at the Air harder, trying like Ray to tighten his spirals around the vortex lines. This was the most difficult manoeuvre he’d attempted, and he was forced to concentrate, to think about each motion of his arms and legs.

His foot slipped on the board's ridges. He stumbled through the Air, upwards towards the vortex line at the axis of his spiral. The board fell away from his feet. As he came within a mansheight of the vortex line he felt the Air thicken, drag at his chest and limbs. He was picked up and hurled around the vortex singularity, and sent tumbling away into the Air.

He rolled on his back and kicked easily at the Air, Waving himself to a stop. He lay against the soft resistance of the Magfield, laughing softly, his chest dragging at the Air.

Ray came slithering across the Magfield on her board; she carried Cris's board under her arm. 'I bet you couldn't do that again if you tried.'

He took the board from her. 'I guess I should take this back to Cris. He's been very patient.'

She shrugged, and pushed a stray length of hair away from her face. 'I suppose so. You want one more run first?'

He hesitated, then felt his grin return. 'One more.'

Suddenly he twisted the board in the Air, bent his knees and slipped the board under his feet. He thrust at the length of wood as rapidly as he could, and soared away through a tunnel of vortex lines. Behind him he heard her laugh and clamber onto her own board.

He sailed over the Pole, over the passive bulk of Parz City once more. He thrust at the board, still awkwardly he knew, but using all his upfluxer strength now. The vortex lines seemed to shoot past like spears, slowly curving, and the weak breeze of the Air plucked at his hair.

The corridor of vortex light was infinite before him. The ease of movement, after the restriction of spiralling, was exhilarating. He was moving faster than he'd ever moved in his life. He opened his mouth and yelled.

He heard Ray shouting behind him. He glanced over his shoulder. She was still chasing him, but he'd given himself a good lead. It would take her a while to catch him yet. She was cupping a hand around her mouth and calling something, even as she Surfed. He frowned and looked more closely, but he couldn't make out what she was trying to tell him. Now she was pointing at him - no, *past* him.

He turned his head again, to face the direction of his flight. There was something in his path.

Spin-web.

The fine, shining threads seemed to cover the sky before him. He could see where the web was suspended from the vortex line array by small, tight rings of webbing which encircled the vortex lines without quite touching the glowing spin-singularities. Between the anchor rings, long lengths of thread looped across the vortex arrays. The complex mats of threads were almost invisible individually, but they caught the yellow and purple glow of the Mantle, so that lines of light formed a complex tapestry across the sky ahead.

It was really very beautiful, Farr thought abstractedly. But it was a wall across the sky.

The spin-spider itself was a dark mass in the upper left corner of his vision. It looked like an expanded, splayed-open Air-pig. Each of its six legs was a mansheight long, and its open maw would be wide enough to enfold his torso. It seemed to be working at its web, repairing broken threads perhaps. He wondered if it had spotted him - if it had started moving already towards the point where he would impact the net, or if it would wait until he was embedded in its sticky threads.

Only a couple of heartbeats had passed since he'd seen the web, and yet already he'd visibly reduced his distance to it.

He swivelled his hips and beat at the Magfield with his Surfboard, trying to shed his velocity. But he wouldn't be able to stop in time. He looked quickly around the sky, seeking the edges of the web. Perhaps he could divert rather than stop, fly safely around the trap. But he couldn't even *see* the edges of the web. Spin-spider webs could be hundreds of mansheights across.

Maybe he could break through the web, burst through to the other side before the spider could reach him. It had to be impossible - there were layers to the web, a great depth of sticky threads before him - but it seemed his only chance.

How could he have been so stupid as to fall into such a trap? He was supposed to be the upfluxer, the wild boy; and yet he'd made one of the most basic mistakes a Human Being could make. Ray and Cris would think him a fool. His *sister* would think him a fool, when she heard. He imagined her voice, tinged with the tones of their father: 'Always look up- and downflux. *Always*. If you scare an Air-piglet, which way does it move? Downflux, or upflux, along the flux paths, because it can move quickest

that way. That’s the easiest direction to move for any animal - cut across the flux paths and the Magfield resists your motion. And that’s why predators set their traps across the flux paths, waiting for anything stupid enough to come fleeing along the flux direction, straight into an open mouth . . .’

The web exploded out of the sky. He could see more detail now - thick knots at the intersection of the threads, the glistening stickiness of the threads themselves. He turned in the Air and thrust with the board, trying to pick up as much speed as he could. He crouched over the board, his knees and ankles still working frantically, and tucked his arms over his head.

He’d remain conscious after he was caught in the thread. Uninjured, probably. He wondered how long the spin-spider would take to clamber down to him. Would he still be aware when it began its work on his body?

A mass came hurtling over his head, towards the web. He flinched, almost losing his board, and looked up. Had the spider left its web and come for him already? . . .

But it was the girl, Ray. She’d chased him and passed him. Now she dived, ahead of Farr, deep into the tangle of webbing. She moved in a tight spiral as she entered the web, and the edge of her board cut through the glistening threads. Farr could see the dangling threads brushing against her arms and shoulders, one by one growing taut and then slackening as she moved on, burrowing through the layers of web.

She was cutting a tunnel through the web for him, he realized. The ragged-walled tunnel was already closing up - the web seemed to be designed for self-repair - but he had no choice but to accept the chance she’d given him.

He hurtled deep into the web.

It was all around him, a complex, three-dimensional mesh of light. Threads descended before his face and laid themselves across his shoulders, arms and face; they tore at the fabric of his coverall and his skin and hair, and came loose with small, painful rips. He cried out, but he dared not drop his face into his hands, or close his eyes, or lift his arms to bat away the threads, for fear of losing his tenuous control of the board.

Suddenly, as rapidly as he had entered it, he was through the web. The last threads parted softly before him with a soft, sucking sigh, and he was released into empty Air.

Ray was waiting for him a hundred mansheights from the border of the web, with her board tucked neatly under her arm. He brought his board to a halt beside her and allowed himself to tumble off gracelessly.

He turned and looked back. The tunnel in the web had already closed - all that remained of it was a dark, cylindrical path through the layers of webbing, showing where their passage had disrupted the structure of the web - and the spin- spider itself was making its slow, patient way past the vortex lines on its way to investigate this disturbance in its realm.

Farr felt himself shuddering; he didn't bother trying to hide his reaction. He turned to Ray. 'Thank you . . .'

'No. Don't say it.' She was grinning. She was showing no fear, he realized. Her pores were wide open and her eyecups staring, and again she exuded the vivid, unbearably attractive aliveness which had struck him when he'd first met her. She grabbed his arms and shook him. 'Wasn't it fantastic? What a ride. Wait till I tell Cris about this . . .'

She jumped on her board and surged away into the Air.

As he watched her supple legs work the board, and as the reaction from his brush with death worked through his shocked mind, Farr once again felt an unwelcome erection push its way out of his cache.

He climbed onto his board and set off, steering a wide, slow course around the web.

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9

After a few days Toba returned, and told Dura and Farr that he had booked them into a labour stall in the Market. Dura was given to understand that Toba had done them yet another favour by this, and yet he kept his eyes averted as he discussed it with them and, when they ate, Cris seemed embarrassed into an unusual silence. Ito fussed around the upfluxers, her eyecups deep and dark.

Dura and Farr dressed as usual in the clothes the family had loaned them. But Toba told them quietly that, this time, they should go unclothed. Dura peeled off the thick material of her coverall with an odd reluctance; she could hardly say she had grown used to it, but in the bustling streets she knew she would feel exposed - conspicuously naked.

Toba pointed, embarrassed, to Dura's waist. 'You'd better leave that behind.'

Dura looked down. Her frayed length of rope was knotted, as always, at her waist, and her small knife and scraper were comforting, hard presences just above her hips at her back. Reflexively her hands flew to the rope.

Toba looked at Ito helplessly. Ito came to Dura hesitantly, her hands folded together. 'It really would be better if you left your things here, Dura. I think I understand how you feel. I can't imagine how I'd cope in your position. But you don't *need* those things of yours, your weapons. You do understand they couldn't really be much protection to you here anyway . . .'

'That's not the point,' Dura said. In her own ears her voice sounded ragged and a little wild. 'The point is . . .'

Toba pushed forward impatiently. 'The point is we're getting late. And if you want to be successful today, Dura - and I assume you do - you're going to have to think about the effect those crude artifacts of yours would have on a prospective purchaser. Most people in Parz think you're some kind of half-tamed animal already.'

'Toba . . .' Ito began.

'I'm sorry, but it's the truth. And if she goes down the Mall with a knife at her waist - well, we'll be lucky not to be picked up by the guards before we even reach the Market.'

Farr moved closer to Dura, but she waved him away. 'It's all right, Farr.' Her voice was steadier now. More *rational*. 'He's right. What use is

this stuff anyway? It’s only junk from the upflux.’

Slowly she unravelled the rope from her waist.

The noise of the Market heated the Air even above the stifling clamminess of the Pole. People swarmed among the stalls which thronged about the huge central Wheel, the colours of their costumes extravagant and clashing. Dura folded her arms across her breasts and belly, intimidated by the layers of staring faces around her.

Farr was quiet, but he seemed calm and watchful.

Toba brought them to a booth - a volume cordoned off from the rest of the Market by a framework of wooden bars. Inside the booth were ten or a dozen adults and children, all subdued, unkempt and shabbily dressed compared to most of the Market’s inhabitants; they stared with dull curiosity at the nakedness of Dura and Farr.

Toba bade the Human Beings enter the booth.

‘Now,’ he said anxiously, ‘you do understand what’s happening here, don’t you?’

‘Yes,’ said Farr, his eyes tight. ‘You’re going to sell us.’

Toba shook his round head. ‘Not at all. Anyhow, it’s nothing to do with me. This is a Market for work. Here, *you* are going to sell *your labour* - not yourselves.’

Four prosperous-looking individuals - three men and a woman - had already emerged from the Market’s throng and come over to the booth. They were studying both the Human Beings curiously but seemed particularly interested in Farr. Dura said to Toba, ‘I doubt it’s going to make much practical difference. Is it?’

‘It’s all the difference in the world. You sign up for a fixed-term contract . . . Your liberty remains your own. And at the end of it . . .’

‘Excuse me.’ The woman buyer had interrupted Toba. ‘I want to take a look at the boy.’

Toba smiled back. ‘Farr. Come on out. Don’t be afraid.’

Farr turned to Dura, his mouth open. She closed her eyes, suddenly ashamed that she could do so little to protect her brother from this. ‘Go on, Farr. They won’t hurt you.’

Farr slid through the wooden bars and out of the booth.

The woman was about Dura’s age but a good deal plumper; her hair-tubes were elaborately knotted into a gold-and-white bun, and layers of fat

showed over her cheekbones. With the air of a professional she peered into the boy's eyecups, ears and nostrils; she bade him open his mouth and ran a finger around his gums, inspecting the scrapings she extracted. Then she poked at Farr's armpits, anus and penis-cache.

Dura turned away from her brother's misery.

The woman said to Toba, 'He's healthy enough, if underfed. But he doesn't look too strong.'

Toba frowned. 'You're considering him for Fishing?'

'Yes . . . He's obviously slim and light. But . . .'

'Madam, he's an upfluxer,' Toba said complacently.

'Really?' The woman stared at Farr with new curiosity. She actually pulled away from him a little, wiping her hands on her garment.

'And that means, of course, for his size and mass he's immensely strong, here at the Pole. Ideal for the Bells.' Toba turned to Dura, and his voice was smooth and practised. 'You see, Dura, the material of our bodies is changed, here at the Pole, because the Magfield is stronger.' He seemed to be talking for the sake of it - to be filling in the silence while the woman pondered Farr's destiny. 'The bonds between nuclei are made stronger. That's why it feels hotter here to you, and why your muscles are . . .'

'I'm sure you're right,' the woman cut in. 'But . . .' She hesitated. 'Is he . . .'

'Broken in?' Dura interrupted heavily.

'Dura,' Toba warned her.

'Lady, he is a Human Being, not a wild boar. And he can speak for himself.'

Toba said rapidly, 'Madam, I can vouch for the boy's good nature. He's been living in my home. Eating with my family. And besides, he represents good value at . . .' - his face puffed out, and he seemed to be calculating rapidly - 'at fifty skins.'

The woman frowned, but her fat, broad face showed interest. 'For what? The standard ten years?'

'With the usual penalty clauses, of course,' Toba said.

The woman hesitated.

A crowd was gathering around the Market's central Wheel. The noise level was rising and there was an air of excitement . . . of dangerous

excitement, Dura felt; suddenly she wished the booth formed a more substantial cage around her.

‘Look, I don’t have time to haggle; I want to watch the execution. Forty-five, and I’ll take his option.’

Toba hesitated for barely a moment. ‘Done.’

The woman melted into the crowd, with a final intrigued glance at Farr.

Dura reached out of the booth-cage and touched Toba’s arm. ‘*Ten years?*’

‘That’s the standard condition.’

‘And the work?’

Toba looked uncomfortable. ‘It’s hard. I’ll not try to hide that. They’ll put him in the Bells . . . But he’s strong, and he’ll survive it.’

‘And after he’s too weak to work?’

He pursed his lips. ‘He won’t be in the Bells forever. He could become a Supervisor, maybe; or some kind of specialist. Look, Dura, I know this must seem strange to you, but this is our way, here in Parz. It’s a system that’s endured for generations . . . And it’s a system you accepted, implicitly, when you agreed to come here in the car, to find a way to pay for Adda’s treatment. I did try to warn you.’ His round, dull face became defiant. ‘You understood that, didn’t you?’

She sighed. ‘Yes. Of course I did. Not in every detail, but . . . I couldn’t see any choice.’

‘No,’ he said, his voice hard. ‘Well, you don’t have, any choice, now.’

She hesitated before going on. She hated to beg. But at least Toba and his home were fixed points in this new world, nodes of comparative familiarity. ‘Toba Mixxax. Couldn’t *you* buy us . . . our labour? You have a ceiling-farm at the Crust. And . . .’

‘No,’ he said sharply. Then, more sympathetically, he went on, ‘I’m sorry, Dura, but I’m not a prosperous man. I simply couldn’t afford you . . . Or rather, I couldn’t afford a fair price for you. You wouldn’t be able to pay off Adda’s bills. Do you understand? Listen, forty-five skins for ten prime years of Farr, unskilled as he is, may seem a fortune to you; but believe me, that woman got a bargain, and she knew it. And . . .’

His voice was drowned by a sudden roar from the crowd around the huge Wheel. People jostled and barged each other as they swarmed along

guide ropes and rails. Dura - listless, barely interested - looked through the crowd, seeking the focus of excitement.

A man was being hauled through the crowd. His two escorts, Waving strongly, were dressed in a uniform similar to the guards at Muub's Hospital, with their faces made supernaturally menacing by heavy leather masks. Their captive was a good ten years older than Dura, with a thick mane of yellowing hair and a gaunt, patient face. He was stripped to the waist and seemed to have his hands tied behind his back.

The crowds flinched as he passed, even as they roared encouragement to his captors.

Dura rubbed her nose, depressed and confused. 'I don't know what you're talking about. How are forty-five skins a fortune? Skins of what?'

He had to shout to make himself heard. 'It means, ah, forty-five Air-pig skins.'

That seemed clearer. 'So you're saying Farr's labour is worth as much as forty-five Air-pigs?'

'No, of course not.'

A new buyer came by the booth, a man who briefly asked about Farr. Toba had to turn him away but indicated Dura was available. The buyer - a coarse, heavy-set man dressed in a close-clinging robe - glanced over Dura cursorily before moving on.

Dura shuddered. There had been nothing threatening in the man's appraisal, still less anything sexual. In fact - and this was the ghastly, dispiriting part of it - there had been nothing personal in it at all. He had looked at her - *her*, Dura, daughter of Logue and leader of the Human Beings - the way she might weigh up a spear or knife, a carved piece of wood.

As a tool, not a person.

Toba was still trying to explain *skins* to her. 'You see, we're not talking about real pigs.' He smiled, patronizing. 'That would be absurd. Can you imagine people carting around fifty, a hundred Air-pigs, to barter with each other? It's all based on credit, you see. A skin is equivalent to the value of one pig. So you can exchange skins - or rather, amounts of credit in skins - and it's equivalent to bartering in pigs.' He nodded brightly at her. 'Do you see?'

'So if I had a credit of one skin - I could exchange it for one pig.'

He opened his mouth to agree, and then his face fell. ‘Ah - not quite. Actually, a pig - a healthy, fertile adult - would cost you about four and a half skins at today’s prices. But the cost of an actual *pig* is irrelevant . . . That isn’t the point at all. Can’t you see that? It’s all to do with inflation. The Air-pig is the base of the currency, but . . .’

She turned her face away. She knew it was important to make sense of the ways of these people, if she were ever to extricate herself and her charges from this mess, but the flux lines of understanding across which she would have to Wave were daunting.

Now another man came to inspect her. This one was short, fussy and dressed in a loose suit; his hair-tubes were dyed a pale pink. He and Toba shook hands. They seemed to know each other. The man called her out of the booth and, to her shame, began to subject her to the intimate examination which Farr had suffered earlier.

Dura tried not to think about the strange little man’s probing fingers. She watched the captive, who had now been led to the wooden Wheel. His arms and legs were crudely outstretched by the guards and fixed by ropes to four of the spokes, while a thong was drawn around his neck to attach his head to the fifth spoke. Dura, even as she endured her own humiliation, winced as the thong cut into the man’s flesh.

The crowd bellowed, squirming around the Wheel in a frenzy of anticipation; despite the finery of their clothes, Dura was reminded of feeding Air-pigs.

Toba Mixxax touched her shoulder. ‘Dura. This is Qos Frenk. He’s interested in your labour . . . Only five years, though, I’m afraid.’

Qos Frenk, the pink-haired buyer, had finished his inspection. ‘Age catches up with us all,’ he said with sad sympathy. ‘But my price is fair at fifteen skins.’

‘Toba Mixxax, will this cover the costs of Adda, with Farr’s fee?’

He nodded. ‘Just about. Of course, Adda himself will have to find work once he’s fit. And . . .’

‘I’ll take the offer,’ she told Toba dully. ‘Tell him.’

The Wheel started to turn about its axis.

The crowd screamed. At first the revolutions were slow, and the man pinned to it seemed to smile. But momentum soon gathered, and Dura could see how the man’s head rattled against its spoke.

‘Dura, I know Qos,’ Toba said. ‘He’ll treat you well.’

Qos Frenk nodded at her, not unkindly.

‘How close will I be to Farr?’

Toba hesitated, looking at her strangely. Qos Frenk seemed confused.

Now the victim’s eyecups had closed; his fists were clenched against the pain of the rotation. Memories of Adda’s attack by the sow returned to Dura. As the man was spun around, the Air in his capillaries would lose its superfluidity, begin to coagulate and slow; a sphere of agonizing pain would expand out through his body from the pit of his stomach, surrounding a shell of numbness. And...

‘Dura, you don’t understand. Qos owns a ceiling-farm which borders on mine. So you’ll be working at the Crust . . . as a coolie. I explained to Qos how well adapted you upfluxers are for such work; in fact I found you at the Crust, and . . .’

‘What about Farr?’

‘He will be in the Harbour. He will be a Fisherman. Didn’t you understand that? Dura . . .’

Now the man was rotating so fast that his limbs had become a blur. He must be unconscious already, Dura thought, and it was a mercy not to be able to see his face.

‘Where is the Harbour, Toba Mixxax?’

He frowned. ‘I’m sorry,’ he said, sounding genuinely contrite. ‘I forget sometimes how new all this is for you. The Harbour is at the base of the City, at the top of the Spine . . . the pillar of wood which descends from the base of the City. Bells from the Harbour follow the length of the Spine, diving deep into the underMantle. And . . .’

‘And it’s not acceptable,’ she snarled. Qos Frenk flinched from her, eyecups wide. ‘I must be with Farr.’

‘No. Listen to me, Dura. *That’s not an option*. Farr is ideal for the Harbour; he’s young and light but immensely strong. You’re too old for such work. I’m sorry, but that’s the way it is.’

‘We won’t be parted.’

Toba Mixxax’s face was hard now, his weak chin thrust forward. ‘You listen to me, Dura. I’ve done my best to help you. And Ito and Cris have grown fond of you; I can see that. But I’ve my own life to lead. Accept this now or I just Wave away out of here. And leave you, and your precious

brother, to the mercy of the Guards . . . and within half a day you'll be joining that man on the Wheel, two more unemployable vagrants.'

Now the Wheel was a blur. The crowd bellowed its excitement.

There was a popping sound, soft and obscene. The Wheel rapidly slowed; the man's hands, feet and head dangled as the Wheel turned through its final revolutions.

The prisoner's stomach cavity had burst; Air-vessels dangled amid folds of flesh like fat, bloody hair-tubes. The crowd, as if awed, grew silent.

Toba, oblivious, still stared into Dura's face. 'What's it to be, Dura?' he hissed.

The guards cut the Broken man down from the Wheel. The crowd, with a rising buzz of conversation, started to disperse.

Dura and Farr were allowed to visit Adda in his Hospital room - his *ward*, Dura remembered.

A huge fan turned slowly on one wall and the ward was pleasantly cool - it was almost like the open Air. The Hospital was close to the City's outer wall and the ward was connected to the outside world by only a short duct and was comparatively bright; entering it, Dura had an impression of cheerfulness, of competence.

But these initial impressions were rapidly dispelled by the sight of Adda, who was suspended at the centre of the room in a maze of ropes, webbings and bandages, almost all of his battered body obscured by gauzy material. A doctor - called Deni Maxx, a round, prissy-looking woman whose belt and pockets bristled with mysterious equipment - fussed around the suspended Human Being.

Adda peered at Dura and Farr from his nest of gauze. His right upper arm, which had been broken, was coated in a mound of bandages, and his lower legs were strapped together inside a cage of splints. Someone had scraped the pus from his good eye, and applied an ointment to keep out symbiotes.

Dura, oddly, felt more squeamish about Adda's wounds now than when she had been trying to cope with them with her bare hands in the Crust-forest. She was reminded, distressingly, of the dead, displayed animals in the Museum. 'You're looking well,' she said.

'Lying sow,' Adda growled. 'What by the bones of the Xeelee am I doing here? And why haven't you got out while you can?'

The doctor clucked her tongue, tweaking a bandage. ‘You know why you’re here.’ She spoke loudly, as if Adda were a deaf child. ‘You’re here to heal.’

Farr said, ‘Anyway, we’ll be gone soon. I’m off to work in the Harbour. And Dura is going to the ceiling-farm.’

Adda fixed Dura with a one-eyed, venomous stare. ‘You stupid bitch.’

‘It’s done now, Adda; I won’t argue about it.’

‘You should have let me die, rather than turn yourselves into slaves.’ He tried to raise gauze-wrapped arms. ‘What kind of life do you think I’m going to have now?’

Dura found Adda’s tone repellent. It seemed wild, unconstructed, out of place in this huge, ordered environment. She found herself contrasting Adda’s violence with the quiet timidity of Ito, who was living out her life in a series of tiny movements as if barely aware of the constraints of the crush of people around her. Dura would not have exchanged places with Ito, but she felt she understood her now. Adda’s rage was crass, uncomprehending. ‘Adda,’ she said sharply. ‘Leave it. It’s done. We have to make the best of it.’

‘Indeed we do,’ the doctor sighed philosophically. ‘Isn’t that always the way of things?’

Adda stared at the woman. ‘Why don’t you keep out of it, you hideous old hag?’

Deni Maxx shook her head with no more than mild disapproval.

Dura, angry and unsettled, asked the doctor if Adda was healing.

‘He’s doing as well as we could expect.’

‘What’s that supposed to mean? Why can’t you people talk straight?’

The doctor’s smile thinned. ‘I mean that he’s going to live. And it looks as if his broken bones are knitting - slowly, because of his age, but knitting. And I’ve sewn up the ruptured vessels; most of his capillaries are capable of sustaining pressure now . . .’

‘But?’

‘He’s never going to be strong again. And he might not be able to leave the City.’

Dura frowned; brief, selfish thoughts of extended periods of fee-paying crossed her mind. ‘Why not? If he’s healing up as you say . . .’

‘Yes, but he won’t be able to generate the same level of pneumatic pressure.’ Maxx frowned quizzically. ‘Do you understand what that means?’

Dura gritted her teeth. ‘No.’

‘Oh dear. It’s so easy to forget you’re all upfluxers . . .’

Adda closed his eyes and leaned back in his gauze net.

‘Look,’ said Maxx, ‘our bodies function by exploiting the Air’s mass transport properties . . . No? All right.’ She pointed at the fan set into the wall. ‘Do you know why that fan is there - why there are fans installed throughout the. City? To *regulate the temperature* - to keep us cool, here in the heat of the South Pole. The Air we inhabit is a neutron gas, and it’s made up of two components - a superfluid and a normal fluid. The superfluid can’t sustain temperature differences - if you heat it, the heat passes straight through.

‘Now - that means that if you add more superfluid to a mass of Air, its temperature will drop. And similarly if you take superfluid out the temperature rises, because normal fluid is left behind. And that’s the principle the wall fans work on.’

Farr was frowning. ‘What’s that got to do with Adda?’

‘Adda’s body is full of Air - like yours, and mine. And it’s permeated by a network of tiny capillaries, which can draw in superfluid to regulate his temperature.’ Deni Maxx winked at Farr. ‘We have tiny Air-pumps in our bodies . . . lots of them, including the heart itself. And that’s what hair-tubes are for . . . to let Air out of your skull, to keep your brain the right temperature. Did you know that?’

‘And it’s that mechanism which may not work so well, now, for Adda.’

‘Yes. We’ve repaired the major vessels, of course, but they’re never the same once they’re ruptured - and he’s simply lost too much of his capillary network. He’s been left weakened, too. Do you understand that Air also powers our muscles? . . . Look - suppose you were to heat up an enclosed chamber, like this room. Do you know what would happen to the superfluid? Unable to absorb heat, it would flee from the room - vigorously, and however it could. And by doing so it would raise pressure elsewhere.

‘When Adda wants to raise his arm, he heats up the Air in his lungs. He’s not aware of doing that, of course; his body does it for him, burning off some of the energy he’s stored up by eating. And when his lungs are

heated the Air rushes out; capillaries lead the Air to his muscles, which expand and . . .’

‘So you’re saying that because this capillary network is damaged, Adda won’t be as strong again?’

‘Yes.’ She looked from Dura to Farr. ‘Of course you do realize that our lungs aren’t really *lungs*, don’t you?’

Dura shook her head, baffled by this latest leap. ‘What?’

‘Well, we are artifacts, of course. Made things. Or at least our ancestors were. Humans - *real* humans, I mean - came to this world, this Star, and designed us the way we are, so that we could survive, here in the Mantle.’

‘The Ur-humans.’

Maxx smiled, pleased. ‘You know of the Ur-humans? Good . . . Well, we believe that original humans had lungs - reservoirs of some gas - in their bodies. Just as we do. But perhaps their lungs’ function was quite different. You see, our lungs are simply caches of Air, of working gas for the pneumatic systems which power our muscles.’

‘What were they like, the Ur-humans?’

‘We can’t be sure - the Core Wars and the Reformation haven’t left us any records - but we do have some strong hypotheses, based on scaling laws and analogies with ourselves. Analogous anatomy was my principal subject as a student . . . Of course, that was a long time ago. They were much like us. Or rather, we were made in their image. But they were many times our size - about a hundred thousand times as tall, in fact. Because he was dominated by balances between different sets of physical forces, the average Ur-human was a metre tall, or more. And his body can’t have been based, as ours is, on the tin-nucleus bond . . . Do you know what I’m talking about? The tin nuclei which make up our bodies contain fifty protons and one hundred and forty-four neutrons. That’s twelve by twelve, you see. The neutrons are gathered in a spherical shape in symmetries of order three and four. Lots of symmetry, you see; lots of easy ways for nuclei to fit together by sharing neutrons, plenty of ways for chains and complex structures of nuclei to form. The tin-nucleus bond is the basis of all life here, including our own. But not the Ur-humans; the physics which dominated their structure - the densities and pressures we think they inhabited - wouldn’t have allowed any nuclear bonding at all. But they must have had *some* equivalent of the tin bond . . .’

She held out her arms and wiggled her fingers. ‘So they were very strange. But they had arms, and legs, like us - so we believe, because otherwise why would they have given them to us?’

Dura shook her head. ‘That doesn’t make any sense.’

‘Of course it does,’ Maxx smiled. ‘Oh, fingers have their uses. But haven’t there been times when you’d have swapped your long, clumsy legs for an Air-pig’s jetfart bladder? Or for a simple sheet of skin like a Surfer’s board which would let you Wave across the Magfield ten, a hundred times as fast as you can now? You have to face it, my dear . . . We humans are a bad design for the environment of the Mantle. And the reason must be that we are scale models of the Ur-humans who built us. No doubt the Ur-human form was perfectly suited for whatever strange world they came from. But not here.’

Dura’s imagination, overheating, filled her mind with visions of huge, misty, godlike men, prising open the Crust and releasing handfuls of tiny artificial humans into the Mantle . . .

Deni Maxx looked deeply into Dura’s eyecups. ‘Is that clear to you? I think it’s important that you understand what’s happened to your friend.’

‘Oh, it’s clear,’ Adda called from his cocoon. ‘But it doesn’t make a blind bit of difference, because there’s nothing she can do about it.’ He laughed. ‘Nothing, now she’s condemned me to this living hell. Is there, Dura?’

Dura’s anger welled like Deni’s heated superfluid. ‘I’m sick of your bitterness, old man.’

‘You should have let me die,’ he whispered. ‘I told you.’

‘Why didn’t you tell us about Parz City? Why did you leave us so unprepared?’

He sighed, a bubble of thick phlegm forming at the corner of his mouth. ‘Because we were thrown out ten generations ago. Because our ancestors travelled so far before building a home that none of us thought we would ever encounter Parz again.’ He laughed. ‘It was better to forget . . . What good would it do to know such a place existed? But how could we know they would spread so far, staining the Crust with their ceiling-farms and their Wheels? Damn them . . .’

‘Why were we sent away from Parz? Was it because . . .’ She turned, but Deni Maxx was making notes on a scroll with a Corestuff stylus, and

did not appear to be listening. ‘Because of the Xeelee?’

‘No.’ He grimaced in pain. ‘No, not because of the Xeelee. Or at least, not directly. It was because of how our philosophy caused us to behave.’

The Human Beings believed that knowledge of the Xeelee predated the arrival of humans in the Star - that it had been brought there by the Ur-humans themselves.

The Xeelee, godlike, dominated spaces so large - it was said - that by comparison the Star itself was no more than a mote in the eyecup of a giant. Humans, striving for supremacy, had resented the Xeelee - had even gone to hopeless war against the great Xeelee projects, the constructs like the legendary Ring.

But over the generations - and as the terrible defeats continued - a new strand had emerged in human thought. No one understood the Xeelee’s grand purposes. But what if their projects were aimed, not at squalid human-scale goals like the domination of others, but at much higher aspirations?

The Xeelee were much more powerful than humans. Perhaps they always would be. And perhaps, as a corollary, they were much more *wise*.

So, some apologists began to argue, humans should trust in the Xeelee rather than oppose them. The Xeelee’s ways were incomprehensible but must be informed by great wisdom. The apologists developed a philosophy which was accepting, compliant, calm, and trusting in an understanding above any human’s.

Adda went on, ‘We followed the way of the Xeelee, you see, Dura; not the way of the Committee of Parz. We would not obey.’ He shook his head. ‘So they sent us away. And in that we were lucky; now they might simply have destroyed us on their Wheels.’

Deni Maxx touched Dura’s shoulder. ‘You should leave now.’

‘We’ll be back.’

‘No.’ Adda was shifting with ghastly slowness in his cocoon of bindings, evidently trying to relieve his pain. ‘No, don’t come back. Get away. As far and as fast as you can. Get away . . .’

His voice broke up into a bubbling growl, and he closed his eyes.

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10

‘**Y**ou dumb upfluxer jetfart!’ Hosch screamed in Farr’s face. ‘When I want a whole damn tree trunk fed into this hopper I’ll tell you about it!’

Now the Harbour supervisor shoved his bony face forward and his tone descended into a barely audible, infinitely menacing hiss. ‘But until I do . . . and if it wouldn’t trouble you too much . . . maybe you could split the wood just a *little* more finely. Or . . .’ - foul-smelling photons seeping from his mouth - ‘maybe you’d like to follow your handiwork into the hopper and finish your work in there? Eh?’

Farr waited until Hosch was through. Trying to defend himself, he knew from bitter experience, would only make things worse.

Hosch was a small, wiry man with a pinched mouth and eyecups which looked as if they had been drilled into his face. His clothes were filthy and he always smelled to Farr like days-old food. His limbs were so thin that Farr was confident that, with his remarkable upfluxer strength here at the Pole, he - or Dura - could snap the supervisor in two, in a fair fight . . .

At last Hosch seemed to exhaust his anger, and he Waved away to some other part of the hopper line. The labourers who had gathered to relish Farr’s humiliation - men and women alike - gave up their surreptitious surveillance and, with the smugness of spared victims, fixed their attention back on their work.

Air seethed in Farr’s capillaries and muscles. *Upfluxer. He called me upfluxer, again*. He watched his fists bunch . . .

Bzya’s huge hand enclosed both Farr’s own, and, with an irresistible, gentle force, pulled Farr’s arms down. ‘Don’t,’ Bzya said, his voice a cool rumble from the depths of an immense chest. ‘He’s not worth it.’

Farr’s rage seemed to veer between the supervisor and this huge Fisherman who was getting in the way. ‘He called me . . .’

‘I heard what he called you,’ Bzya said evenly. ‘And so did everyone else . . . just as Hosch intended. Listen to me. He wants you to react, to hit him. He’d like nothing better.’

‘He’d be capable of liking nothing after I take off his head for him.’

Bzya threw his head back and roared laughter. ‘And as soon as you did the guards would be down on you. After a beating you’d return to work - to Hosch, to a supervisor who really *would* hate you, and wouldn’t pass up an

opportunity to show it - and to an extra five, or ten, years here to pay his compensation.'

Farr, the remnants of his anger still swirling in him, looked up into Bzya's broad, battered face. 'But I've only just started this shift . . . At the moment I'll be happy just to get through that.'

'Good.' With an immense, powerful hand Bzya ruffled Farr's hair-tubes. 'That's the way to think of it . . . You don't have to get through your whole ten years at once, remember; just one shift at a time.'

Bzya was a huge man with muscles the size of Air-piglets. He was as bulky, powerful and gentle as the supervisor was small and needle-dagger vicious. Bzya's face was marred by a mask of scar tissue which obliterated one side of his head and turned one eyecup into a ghastly cavern that reached back into the depths of his skull. Farr had come to know him as a simple man who had lived his life in the poverty-stricken Downside, keeping himself alive by turning his giant muscles to the mundane, difficult and dangerous labour which allowed the rest of Parz City to function. He had a wife, Jool, and a daughter, Shar. Somehow, through a life of travail, he had retained a kind and patient nature.

Now he said to Farr, winking at him with his good eyecup, 'You shouldn't be hard on old Hosch, you know.'

Farr gaped, trying to suppress a laugh. 'Me, hard on him? Why, the old Xeelee-lover has it in for me.'

Bzya reached to the conveyor and raised a length of tree trunk longer than Farr was tall. With a single blow of his axe he cracked it open to reveal its glowing core. 'See it from his point of view. He's the supervisor of this section.'

Farr snorted. 'Making himself rich out of our work. Bastard.'

Bzya smiled. 'You learn fast, don't you? Well, maybe. But he's also *responsible*. We lost another Bell, last shift. Had you heard? Three more Fishermen dead. Hosch is responsible for that too.'

Disasters seemed to hit the Harbour with a depressing regularity, Farr thought. Still, he remained impatient with Bzya's tolerance, and he began to list Hosch's faults.

'He's all of that, and then some you're too young to understand. Maybe he isn't up to the responsibility he has.

‘But - I’ll say it again - whether he can cope or not, he’s *responsible*. And when one of us dies, a little of him must die too. I’ve seen it in his face, Farr, despite all his viciousness. Remember that.’

Farr frowned. He shoved more glowing wood into the hoppers. It was so complex. If only Logue or Dura were here to help him make sense of it all . . .

Or if only he could get out of here and *Surf*.

The rest of the shift wore away without incident. Afterwards Farr filed out with the rest of the labourers to the small, cramped dormitory they shared. The dormitory, home to forty people, was a stained box slung across with sleeping ropes. It stank of shit and food. Farr ate his daily ration - today, a small portion of tough bread - and looked for a stable nest in the web of sleeping-ropes. He wasn’t yet confident enough to challenge the older, powerful-looking Fishermen, men and women both, who monopolized the chamber walls where the Air was slightly less polluted by the grunts and farts of others. He finished up, as usual, close to the centre of the dormitory.

One day, he told himself as he closed his eyes and sought sleep. One day.

At the start of his next shift, with eyecups still crusted with sleep deposits, he filed back to his post at the wood hoppers.

The Harbour was an irregular compound of large chambers constructed of stained wood and fixed to the base of the City - in the shadow of the Downside, well away from the bright, fashionable sectors of the upper levels. It was just below the huge dynamos which powered the anchor-bands, and the deep, thrumming vibration of the machines above was a constant accompaniment to life for the Fishermen. The Harbour was a dark, hot, filthy place to work, and the contrast of the heat of the stoves, the grinding roar of the pistons and pulleys with the open Air of the upflux, made it all but unbearable for Farr.

Still, as his shift wore on, Farr relaxed into his work’s heavy, steady rhythms. He hauled the next massive length of tree trunk from the conveyor belt that ran continually behind the row of labourers. He was forced to wrestle with the chunk of wood; its inertia seemed to turn it into a wilful, living thing, determined to plough its own path through the Air regardless of Farr’s wishes. The muscles in his arms and back bulged as he braced

himself against the floor of the chamber and swung at the section of trunk with his axe of wood, hardened with a tip of Corestuff. The trunk was tough, but split easily enough if he swung the blade along the direction of the grain. When the split was deep enough, Farr forced his hands into the cracked wood and prised the trunk section open, releasing a flood of warmth and green light from the nuclear-burning interior which bathed his face and chest. Then, with the nuclear fire still bright, he dumped the hot fragments into the gaping maw of the hopper before him.

Cutting the wood was the part of his work Farr enjoyed the most, oddly. There was a certain skill to be applied in finding exactly the right spot for his axe blade, a skill Farr found pleasure in acquiring and applying. And when the wood split open under his coaxing, releasing its energy with a sigh of warmth, it was like revealing some hidden treasure.

A line of labourers worked alongside Farr, stretching almost out of sight in the gloom of the Harbour; working in shifts, they fed the ravenous maw of the hoppers unceasingly. The work was heavy, but not impossibly so for Farr, thanks to his upfluxer muscles. In fact, he had to take care not to work too fast; exceeding his quota didn’t earn him any popularity with his workmates.

The heat energy released by the wood’s burning nuclei was contained in great, reinforced vessels - boilers - in another part of the Harbour complex. Superfluid Air, fleeing the heat, was used to drive pistons. These pistons were immense fists of hardened wood twice Farr’s height which plunged into their jackets as steady as a heartbeat.

The pistons, via huge, splintered rotary arms, turned pulleys; and it was the pulleys which sent Bells full of fearful Fishermen towards the mysterious and deadly depths of the underMantle.

It was so different from his life with the Human Beings, where there were no devices more complex than a spear, no source of power save the muscles of humans or animals. The Harbour was like an immense machine, with the sole purpose of sending Fishermen down into the underMantle. He felt as if he were a component of that huge machine himself, or as if he were labouring inside the heart of some giant built of wood and rope . . .

Bzya apart, the other workers showed no signs of accepting Farr. It was as if their unhappiness with their lot, here in this noisy, stinking inferno, had been turned inwards on themselves, and on each other. But still, once each

new shift had settled in, the workers seemed to reach a certain rhythm, and a mood of companionship settled over the line - a mood which, Farr sensed, extended even to him, as long as he kept his mouth shut.

He missed Dura, and the rest of the Human Beings, and he missed his old life in the upflux. Of course he did. His sentence in this Harbour seemed to stretch off to eternity. But he was able to accept his lot, as long as he kept his mind focused on the task in hand, and took comforts where he could find them. One shift at a time, that was the secret, as Bzya had told him. And . . .

‘You.’

There was a hand on his shoulder, grasping at his grubby tunic. He was roughly dragged out, of the line.

Hosch glared at him, his nostrils glowing sickly-white. ‘Change of assignment, ’ he growled.

‘What?’

‘A Bell,’ Hosch said.

As Dura approached - with twenty other new coolies in a huge car drawn by a dozen stout Air-pigs - Frenk’s ceiling-farm seemed tiny at first, a child’s palmprint against the immensity of the Crust itself. The other coolies seemed more interested in another farm, still more distant and harder to make out than Frenk’s. This belonged to Hork IV, Chair of Parz City, Dura was told. The absent-minded Chair escaped his civic responsibilities - leaving Parz in the scheming hands of his son - by indulging in elaborate agricultural experiments, here at the Crust. On Hork’s ceiling-farm there were said to be spears of wheat taller than a man, and Crust-trees no longer than a man’s arm and bound up with lengths of Corestuff-wire . . .

Dura was barely able to keep her attention focused on this prattle. The thought of being marooned at the Crust, with only these dullards for company, made her heart sink.

At last Frenk’s ceiling-farm filled the clearwood windows. The car settled to rest at the centre of a group of crude wooden buildings, and the doors opened.

Dura scrambled out and Waved away from the others. She took a deep breath of clean, empty Air, relishing the sensation in her lungs and capillaries. The Air stretched away all around her, an immense, unbroken

layer stretching right around the Star; it was like being inside the lungs of the Star itself. Well, the company might leave a bit to be desired, but at least here she could breathe Air which didn't taste like it had been through the lungs of a dozen people already.

Qos Frenk himself was there to greet them. He picked out Dura, smiling with apparent kindness at her, and while the other coolies dispersed among the buildings, he offered to show Dura around his farm.

Frenk - dapper, round and sleek, his pink hair flowing over an elaborate cloak - Waved confidently beside her. 'The work is straightforward enough, but it needs concentration and care . . . qualities, sadly, which not all coolies nowadays share. I'm sure you'll do a fine job, my dear.'

Dura was wearing a coverall woven of some crude vegetable-fibre cloth, given to her as a parting gift by Ito. As she Waved, it grated against her skin constantly, as if chafing her all over, and she longed to tear it off. On her back she carried a round pod of wood - an Air-tank, like the one she'd seen Toba wear, with a small mask she was supposed to fit over her face to help her breathe the rarefied Air of the upper Mantle. The bulky, unnatural thing impeded her movement even more than the City-made clothes, but Frenk insisted she carry it. 'Health ordinances, you see,' he had said with a philosophical shrug, his ornate cloak bunching around his thin shoulders.

Under the coverall, she still wore her length of rope and her small knife.

The farm had largely been cleared of tree trunks; the exposed forest root-ceiling was seeded with neat rows of green-gold wheat, of altered grass. Here, hovering just a few mansheights below the wafting, swollen tips of mutant grass, she could no longer see the boundaries of the farm. It was as if the Crust's natural wildness had been banished, overrun by this claustrophobic orderliness.

Of course the orderliness covered only two dimensions. The third dimension led down to the clean, free Air of the Mantle which hung below her, huge and empty. The Parz folk had not yet succeeded in fencing off the Air itself . . . All she needed to do was to throw this Air-tank into the round, delicate face of Qos Frenk, and Wave away into infinity. These soft City-bores - even the coolies - could never catch her.

But she could never quit this place, abandon her obligations, until Adda's fees were paid off. Ties of obligation and duty would imprison her

here as surely as any cage.

Qos Frenk blinked, studying her. ‘I know this must be a strange situation for you. I want you to know you’ve nothing to fear but hard work. I own the ceiling-farm, and I own your labour, in that sense. But I don’t make the mistake of imagining I own your soul.

‘I’m not a cruel man, Dura. I believe in treating my coolies as well as I can afford. And . . .’

‘Why?’ Dura found herself snarling. ‘Because you’re such a noble person?’ He smiled. ‘No. Because it’s economically more efficient for me to have a happy and healthy workforce.’ He laughed, and he looked a little more human to Dura. ‘That should reassure you if nothing else does. I’m sure you’ll be fine here, Dura. Why, as soon as you learn the trade I don’t see why we shouldn’t be thinking of you as a future supervisor, or skills specialist.’

She forced herself to smile back. ‘All right. Thank you. I understand you’re doing your best for me. What will I have to do?’

He indicated the rows of ripening wheat dangling from the forest ceiling above them. ‘In a few weeks we’ll be ready for the harvest, and that’s when the real work begins. But for now your job is to ensure that the growth of the wheat is unimpeded. Look for the obvious, like boars crushing the stems. Or trespassers.’ He looked saddened. ‘We get a lot of that nowadays . . . scavengers, I mean. A lot of poverty in the City, you see. Watch out for blight. Any kind of discoloration, or growth abnormalities . . . If we get any diseases we isolate the area and sterilize it fast, before the infection spreads.

‘Look for wild grass, any plants growing among the roots, damaging the wheat. We don’t want anything else absorbing the lovely Crust isotopes which were meant for our crop . . . And that includes young trees. You’d be surprised how fast they grow.’ He spread his hands wide. His enthusiasm was almost endearing, Dura thought. ‘You wouldn’t think it but this part of the Crust was all native forest, once.’

‘Remarkable,’ Dura cut in dryly, remembering the broad, unspoiled forests of her home area in the far upflux.

Frenk looked at her uncertainly.

They met another worker, a woman who drifted with her head lost in the green-gold crop and her legs dangling down into the Air. The woman was

hauling small saplings down from between the green stems of the wheat and shoving the weeds into a sack bound to her waist.

‘Ah,’ Frenk said with a smile. ‘One of my best workers. Rauc, meet Dura. Just arrived here. Perhaps you’d be good enough to show her around . . .’

The woman drifted slowly down from the dangling crop. Over her head, Rauc was wearing her Air-helmet, a veil of soft, semitransparent gauze which covered a broad-brimmed hat. The curtain bulged out a little, showing that it was being fed by Air from the woman’s tank.

Frenk Waved fussily away.

Rauc was slim and wore a simple smock of grubby leather, though her arms were bare. After Frenk’s departure she regarded Dura sombrely for a few moments without speaking. Then she untied her veil and lifted it. Her face was thin and tired, her eyecups dark; she looked about Dura’s own age. ‘So you’re the upfluxer,’ she said, her voice containing the flat whine of the City-born.

‘Yes.’

‘We heard you were coming. We were glad. Do you know why?’

Dura shrugged, uncaring.

‘Because you upfluxers are strong . . . You’ll work hard, help us meet our quotas.’ She sniffed. ‘As long as you don’t show us up, you’ll be popular enough.’

‘I understand.’ This woman was trying to warn her, she realized. ‘Thanks, Rauc.’

Rauc led her beneath the golden ceiling-fields back towards the cluster of structures at the heart of the farm, where Dura had been dropped on first arrival. There was no sign of Qos Frenk’s car; Dura imagined him returning to his cosy, stuffy home inside the City. Now, in mid-shift, the little huts seemed deserted: they were small, boxy buildings of wood, dangling by lengths of rope from the truncated stems of Crust-trees. There was a small, unkempt herd of pigs. Rauc said the herd was kept - not for commercial purposes - but to provide meat for the coolies, leather for smocks and hats. Rauc showed her small stores of clothing, Air-sacks and tools. There was a bakery, its inner walls blackened by heat; the coolies’ staple food, bread, was made for them here. A large, overweight man laboured in the gloom of the bakery; he scowled at Dura and Rauc as they peered in at him. Rauc

pulled a face. ‘Well, the bread’s fresh,’ she said. ‘But that’s all you can say for it . . . The lowest-quality wheat ends up here, that and any gleanings we can find, while the best stuff is shipped off to Parz.’

There was a dormitory building, a small, cramped box packed with rows of cocoons. About half the cocoons were occupied. A woman’s sleepy face lifted to stare at them before flopping back into sleep, mouth open and hair dangling. Rauc pointed out a vacant cocoon Dura would be able to claim for herself. But Dura couldn’t imagine sleeping in here, breathing in the snores and farts of others, while the fresh Air of the Mantle swept away all around her. It made her realize, jarringly, that she was going to be as out of place here as in Parz itself. Most of the coolies were, after all, City-born - and mostly from the Downside where conditions were even more cramped than the average. So off-shift coolies shovelled themselves into this stinking box, listening to each other breathe and pretending that they weren’t stranded out here in the Mantle, but were tucked away inside the cosy confines of Parz.

Rauc smiled at her. ‘I think we’ll get along, Dura. You can tell me about your people. And I’ll show you how to get around here.’

‘Frenk seems all right . . .’

Rauc looked surprised. ‘Oh, he’s decent enough. But that doesn’t matter. Not day to day, it doesn’t. I’ll introduce you to our section supervisor, Leeh. *She* makes a difference . . . But not as much as she likes to think. Now Robis - who runs the stores - that’s where the real power lies. Get him to smile on you and the world is a brighter place.’

Dura hesitated. ‘Frenk says I might get to be a supervisor, eventually.’

‘He says that to everyone,’ Rauc said dismissively. ‘Come on, let’s find Leeh; she’s probably off in the fields somewhere . . .’ But she hesitated, looking searchingly at Dura. Then, glancing around to check they were unobserved, she dug into a deep pocket in her smock and drew out a small object. ‘Here,’ she said, placing the object in Dura’s hand. ‘This will keep you well.’

It was a tiny five-spoked Wheel, like the one she’d seen around the neck of Toba Mixxax . . . a model of the execution device in the Market Place. ‘Thank you,’ Dura said slowly. ‘I think I understand what this means.’

‘You do?’ Now Rauc’s look was becoming wary.

Dura hastened to reassure her. ‘Don’t worry. I won’t betray you.’

‘The Wheel is illegal in Parz City,’ Rauc said. ‘In theory it’s illegal everywhere, throughout the Mantle . . . wherever the Guards’ crossbows can reach. But we’re a long way from Parz here. The Wheel is tolerated on the ceiling-farms. Something to keep us happy . . . That old fool Frenk says it’s economically efficient for us to be allowed to practise our faith.’

Dura smiled. ‘That sounds like Frenk.’

‘ . . . But you never know. Do upfluxers follow the Wheel?’

‘No.’ She studied Rauc. She didn’t seem very strong, or much of a rebel; but apparently this Wheel business gave her comfort. ‘I saw a Wheel used as an execution tool.’

‘Yes.’

‘Then why is it a symbol of faith?’

‘*Because* it’s used to kill.’ Rauc looked into her eyes, searching for understanding. ‘So many human lives have been Broken that the Wheel, the very shape of it, has become something human in itself. Or more than human. Do you see? By keeping the Wheel close by us we are staying close to the noblest, bravest part of us.’

Rauc’s speech was intense and earnest. Dura thumbed the little Wheel doubtfully. The cult must be quite widespread. After all, Toba Mixxax was an adherent . . . a ceiling-farm owner. Widespread through the Star, then, and through society itself.

If these Wheel cultists ever found a leader, they could be formidable opponents for the mysterious Committee which ran the City.

Rauc looked tired. ‘Come on. Let’s find Leeh, and get you started.’

Side by side the two women Waved through the orderly Air of the farm, the golden stalks of wheat suspended above them.

Farr was dimly aware of the other workers pulling away from him, sly looks conveying their pleasure at his discomfiture. Chunks of Crust-tree rolled past on their conveyor belt, ignored.

There was a growl. ‘No.’ Bzya, Farr realized, hovering close behind him.

Hosch’s bony head swivelled at Bzya, eyecups deep and empty. ‘You’re questioning me, Fisherman?’

‘This one’s too young,’ Bzya said, laying a huge hand on Farr’s shoulder. Farr, unwilling to lead his friend into trouble, tried to shrug the hand away.

‘But he was recruited for this.’ A muscle in the supervisor’s cheek was twitching. ‘He’s small and light, but he’s got that upfluxer strength. And we’re short of able-bodied . . .’

‘He’s got no skills. No experience. And we’ve taken a lot of losses recently, Hosch. It’s too much of a risk.’

Hosch’s cheek muscle seemed to have a life of its own. When he replied, it was in a sudden scream. ‘I’m not asking your advice, you Xeelee-lover! And if you’re so concerned for this Piglet-turd you can come down as well. Got that? Got that?’

Farr dropped his head. Of course, Hosch wasn’t being logical. If he - Farr - was being taken down because of his size, then surely Bzya shouldn’t be . . .

Bzya simply nodded, apparently unmoved by Hosch’s anger or by his own sudden assignment to peril. ‘Who’s the third?’

‘I am.’ Hosch’s rage still showed in the pulsing of muscles in his face, in the quivering of his eyecup rims. ‘I am. Now get moving, you Pig-lovers, and maybe we’ve got a chance to get down there before the Quantum Sea congeals . . .’

Farr and Bzya followed Hosch out of the hopper chamber. Hosch’s continued abuse passed unheard through Farr’s head, and he could only remember what Bzya had told him about Hosch and responsibility.

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11

The chamber where they were to board the Bell was at the very base of the City. The chamber had walls, an upper surface - but no floor. Farr, following Hosch and Bzya, clung to guide ropes and gazed down into clear Air, drinking in its freshness after days of the stale stenches of the Harbour. He was aware of the immense mass of the City above him; it creaked softly, like some brooding animal.

The Bell itself was a sphere of hardened, battered wood two mansheights across. Hoops of Corestuff were wrapped around it. The Bell was suspended from an immense pulley which was almost lost in the darkness above Farr's head. More cables attached the Bell loosely to the Spine. Farr could make out pale patches in the dimness above, faces of Harbour workers close to the pulley.

The Spine was a pillar of wood which plunged, trailing cables, out of this chamber and speared through the thick Air beneath the City. It turned into a dark line, barely visible, curving slowly to follow the flux of the Magfield. Cables trailed along its length to reach far, far down, into the distant, bruised-purple, lethal mass of the underMantle.

Farr, following the Spine's curve, felt his heart slow inside him.

The Bell seemed impossibly fragile. How could it possibly protect him from dissolution in the depths of the underMantle, hovering over the boiling surface of the Quantum Sea itself? Surely it would be crushed like a leaf; no wonder so many Fishermen lost their lives.

Hosch opened up a large door in the side of the Bell and clambered stiffly inside. Bzya prodded Farr forward. As he approached the sphere Farr saw how badly scuffed and scratched the outer surface was. He ran a finger along one deep scar; it looked as if some animal had attacked this fragile-looking device, gouging it with teeth or nails.

Reassuring, he thought drily.

Farr had expected the interior of the Bell to be something like Mixxax's car, with its comfortable seats and light-admitting windows. Instead he entered a pocket of gloom - in fact he almost collided with Hosch. The only windows were small panels of clearwood which hardly admitted any light; wood-lamps gave off a smoky, apologetic green glow. There was a pole running the length of the sphere's axis, and Farr clung to this. There was a

small control panel - with two worn-looking switches and a lever - and the hull was bulky with lockers and what looked like tanks of Air.

Bzya lumbered into the Bell. The interior was suddenly crowded; and as the Fisherman's huge hands wrapped around the support pole the Bell was filled with Bzya's strong, homely stench. Hosch clambered around them both to pull closed the hatch - a massive disc of wood which fitted snugly into its frame.

They waited in the almost complete gloom. There was a busy scraping from all around the hull. Farr, peering through the windows, saw Harbour workers adjusting the position of the Corestuff hoops so that they surrounded the sphere evenly, covering the hatchway. Farr glanced from Hosch to Bzya. Bzya returned his stare with a patient acceptance, the darkness softening the lines of his scars. The supervisor glared into space, angry and tense.

There was a humming, strangely regular. The whole craft vibrated with it. It seemed to permeate his very being; he could feel his capillaries contracting. He looked at Bzya, but the Fisherman had closed his good eye, his face set; his damaged eyecup was a tunnel to infinity.

. . . And *something changed*. Something was taken away from Farr, lifted for the first time in his life. The only time he had felt anything remotely like this was during that last, fateful hunt with the Human Beings, when he had experienced that disorienting fear of falling. What was happening to him? He felt his grasp of the support pole loosen, his fingers slip from the wood. He cried out, drifting backward.

Bzya's strong hand grasped his hair-tubes and hauled him back to the pole; Farr wrapped his arms and legs around the solidity of the wood.

Hosch was laughing, his voice grating.

Somebody rapped on the Bell with a heavy fist. Now there was a sensation of movement - jerking, swaying; Farr could hear cables rattle against the Bell and against each other.

So it had begun. In brisk, bewildering silence, they were descending towards the underMantle.

'The boy hasn't been prepared for any of this, Hosch.' There was no trace of anger in Bzya's voice. 'I told you. How can he function if his ignorance leaves him paralysed by fear?'

‘Talk to the upfluxer if you want.’ The supervisor turned his thin, creased, self-absorbed face away.

‘What’s happening to me, Bzya? I feel strange. Is it just because we’re descending, following the Spine?’

‘No.’ Bzya shook his head. ‘We are descending, but it’s more than that. Listen carefully, Farr; it’s important that you understand what’s happening to you. Maybe it will keep you alive.’

These words, simply spoken, evoked more fear in the boy than all of Hosch’s ranting. ‘Tell me.’

‘As we descend, the Air gets thicker. You understand that, don’t you? . . .’

Farr understood. In the deadly depths of the underMantle, pressures and densities were so great that nuclei were crammed together, forced into each other. It was impossible for the structures of bonded nuclei which composed human bodies - and all the material which comprised Farr’s world - to remain stable. The nuclei dissolved into the neutron superfluid that was the Air; and protons freed from the nuclei formed a superconducting fluid in the neutron mix.

At last, from the Quantum Sea inwards, the Star was like a single, immense nucleus; no nuclear-based life could persist.

‘How can this Bell of wood protect us? Won’t the wood just dissolve?’

‘It would . . . if not for the Corestuff hoops.’

The hoops were hollow tubes of hyperonic Corestuff. The tubes contained proton superconductor, extracted from the underMantle. More tubes led up through the cables to dynamos in the Harbour which generated electrical currents in the Bell’s hoops.

‘The currents in the hoops generate huge magnetic fields,’ Bzya said. ‘Like our own Magfield. And they protect us. The fields are like an extra wall around the Bell, to insulate it from the pressures.’

‘But what’s making me feel so strange? Is it this magfield of the Bell’s?’

‘No.’ Bzya smiled. ‘The hoops are expelling the Magfield - the Star’s Magfield, I mean - from the interior of the Bell.

‘We all grow up in the Magfield. The Magfield affects us all the time . . . We use the Magfield to move about, when we Wave. Farr, for the first time in your life you can’t feel the Magfield . . . For the first time, you can’t tell which way up you are.’

There was no way of tracking time. The silence was broken only by the clatter of cables, the dull thud of the body of the Bell against the Spine, and the almost subvocal, angry mumblings of Hosch. Farr kept his eyes closed and hoped for sleep.

After an unknowable period the Bell gave a savage lurch, almost jolting the axial bar from Farr's hands. He clung to it, peering around the dimly lit cabin. Something had changed; he could feel it. But what? Had the Bell hit something?

The Bell was still moving, but the quality of its motion had changed - or so the pit of his stomach told him. They were still descending, he was sure; but now the Bell's descent was much smoother, and the occasional collisions of the Bell against the Spine had ceased.

It felt as if the Bell were floating, loose, through the underMantle.

Bzya laid a massive, kindly hand on his arm. 'It's nothing to fear.'

'I'm not . . .'

'We've come free of the Spine, that's all.'

Farr felt his eyes grow round. 'Why? Is something wrong?'

'No.' The cabin's small, woodburning lamps sent a soft glow into the pit of Bzya's ruined eye. 'It's designed to be this way. Look, the Spine only goes down a metre or so from the City. That's deeper than anyone could Wave unaided. But we have to go much, much deeper than that. Now our Bell is descending without the Spine to guide it.

'The cables still connect us to Parz. And the current they're carrying will continue to protect us, and the cable, from the conditions here, as long as we descend. But . . .'

'But we're drifting. And our cable could tangle, or break. What happens if it breaks, Bzya?'

Bzya met his gaze steadily. 'If it breaks, we don't go home.'

'Does that ever happen?'

Bzya turned his face to the lamp. 'When it does, they can tell almost immediately, up in the Harbour,' he said. 'The cable starts to run free. You know the worst straight away. You don't have to wait for the empty end to be returned . . .'

'And us? What would happen to us?'

Hosch pushed his thin face forward. 'You ask a lot of stupid questions. I'll give you some comfort. If the cable breaks, you won't know anything

about it.’ He made his hand into a loose fist and snapped it closed in Farr’s face.

Farr flinched. ‘Maybe you should tell me what else can kill me. Then at least I’ll be prepared . . .’

There was a crash which jarred him loose from the support pole. The Bell swayed, rocking through the thick fluid of the underMantle.

Farr found himself floundering in the Bell’s stuffy Air. Once again he needed Bzya to reach out and haul him back to the central post.

Bzya raised a silencing finger to his lips; Hosch merely glowered.

Farr held his breath.

Something scraped across the outside hull of the Bell; it was like fingernails across wood. It lasted a few heartbeats, and then faded.

After a few minutes of silence, the lurching, unsteady journey continued; Farr imagined metres of cable above his head, kinks mansheights tall running along its length.

‘What was that?’ He glanced up at the windows, which grudgingly admitted a diffuse purple light. ‘Are we in the Quantum Sea?’

‘No, Bzya said. ‘No, the Sea itself is still hundreds of metres below us. Farr, we’re barely going to penetrate the upper layers of the underMantle. But we’re already a couple of metres below the Spine now.’

‘Yeah,’ said Hosch, his deep eyes fixed on Farr. ‘And that was a Colonist, come back from the dead to see who’s visiting him.’

Farr felt his mouth drop open.

‘It’s a Corestuff berg,’ Bzya said steadily. ‘Corestuff. That’s all.’

Hosch sneered, his gaze sliding around the cabin.

Farr knew Hosch was taunting him, but the sudden shock of the words had penetrated his imagination. He had always enjoyed Core War stories, had relished staring into the unachievable surface of the Quantum Sea and frightening himself with visions of the ancient, altered creatures prowling its depths. But the stories of the War, of humankind’s loss, had seemed so remote from everyday experience as to be meaningless.

But Dura had told him of the fractal sculpture she had seen in Parz’s University - a sculpture of a Colonist’s physical form, Ito had said. And now he was descending into the underMantle himself; protected only by a rickety, barely understood technology.

He clung to the post, staring at the bruised light in the windows.

Again there was a scraping against the hull. Again the Bell swayed, causing Farr's stomach to lurch.

This time, Hosch and Bzya did not seem surprised. Hosch turned to press his face to a window, while Bzya relaxed his grip on the support post and flexed the fingers of his immense hands.

'What is it now?' Farr whispered.

'We think we've snagged a berg . . .'

Below the surface of the Quantum Sea, nuclei - clusters of protons and neutrons - could not survive. And deeper still, in the dark belly of the Sea itself, densities became so high that the nucleons themselves were brought into contact. Hyperons, exotic combinations of quarks, could form from the colliding nucleons. The hyperons could combine into stable islands of dense material - Corestuff bergs - which could persist away from the formative densities of the heart of the Star. The bergs drifted up, in Quantum Sea currents, to higher levels to be retrieved by the Fishermen and returned to Parz City.

'It's clinging to the outside of the Bell,' Bzya said. He mimed the impact of the berg against the Bell with his fists. 'See? It's drawn there by the magnetic field of the Bell, of its Corestuff hoops. And it stays, stuck by the Magfield set up in response in its own interior.'

Hosch grinned again, and Farr was aware of the supervisor's foul breath. 'Good Fishing. We were lucky. We can't be more than four metres below Parz. Now, boy. Watch.' With a grandiloquent gesture, Hosch closed the two switches on the small control panel beside him.

Farr held his breath, but nothing seemed to have changed. The Bell still swayed alarmingly through the underMantle - in fact it seemed to be rotating, his stomach told him, perhaps knocked into a twist by the impact of the berg.

Bzya said patiently, 'He's sent a signal to the Harbour, along the cables. That we're ready to be hauled up.'

Hosch grinned at him. 'And that's why we're here, boy. That's the reason they put men in these cages, and stuff them down into the underMantle. All to close those little switches. See? Otherwise, how else would the Harbour know when to haul up the Bells?'

'Why three of us? Why not just one Fisherman?'

‘Double redundancy,’ Hosch said. ‘If something hit the mission - well, one of us might live long enough to throw the switches, and bring home the precious Corestuff.’ He was obviously relishing teasing out Farr’s fear.

Farr tried to bite back. ‘Then you should have told me what was going on before. What if something had gone wrong, and I hadn’t known what to do?’

Bzya regarded Hosch impassively. ‘The boy has a point, Hosch.’

‘Anyway,’ Farr said, ‘it can’t take much skill to throw a simple switch . . .’

‘Oh, that’s not the skill,’ Hosch said quietly. ‘The skill is in staying alive long enough to do it.’

The Bell lurched alarmingly through the underMantle, unbalanced by the mass of Corestuff clinging to its side. Farr tried to judge their ascent, but he couldn’t separate genuine indications of their rise to the light - the sensations in his belly, a lightening of the gloom in the small windows - from optimistic imagination. He gazed anxiously at the bruised-purple glow in the windows, unable to take any of the food Bzya offered him from a small locker set in the hull of the Bell.

The Bell shuddered under a fresh impact. Farr clung to his pole. There was a grinding noise, and the clumsy little craft shuddered to a halt.

Farr resisted the temptation to close his eyes and curl up. *What now? What else can they throw at me?*

He felt Bzya’s rough fingertips on his shoulders. ‘It’s all right, lad. That’s a sign that we’re nearly home.’

‘What was it?’

‘That was our berg, scraping against the Spine. We’re only a metre or so below Parz itself now.’

Hosch hauled at a lever on the control panel, grunting with the effort; the hum Farr had learned to associate with the currents supplying the Bell’s protective magnetic field decreased in intensity. Hosch turned to him, his mood evidently swinging towards its calm, sly pole. ‘Your buddy here is half-right. But we aren’t safe yet. Not by a long way.’

In fact this was one of the most dangerous parts of the mission. The berg, rattling against the Spine, could easily sever their cables or damage the Spine itself.

‘So,’ Hosch said silkily, ‘one of us has to go outside and do some work.’

‘What work?’

‘Wrap ropes around the berg. Lash it to the Bell,’ Bzya said gently. ‘That’s all. Stops the berg from shaking loose, and protects the cables from collisions with the Corestuff.’

Hosch was staring at Farr.

Bzya held up his huge hands. ‘No,’ he said. ‘Hosch, you can’t be serious. You can’t send the boy out there.’

‘I’ve never been more serious,’ Hosch said. ‘As you’ve both been telling me, the boy won’t last five heartbeats down here unless he learns the trade. And there’s only one way to do that, isn’t there?’

Bzya made to protest, but Farr stopped him. ‘It’s all right, Bzya. I’m not afraid. He’s probably right, anyway.’

Bzya said, ‘Listen to me. If you were not afraid you would be a fool, or dead. Fear keeps your eyecups open and clean.’

‘Ropes in that locker,’ Hosch said, pointing.

Bzya started to haul out the tightly packed, thick ropes; soon the little cabin seemed filled with the stuff. ‘And you,’ Hosch snapped at Farr. ‘Get the hatch open.’

Farr looked through the window. The Air - if it could be called Air, this deep - was purple, almost Sea-like. He was still, after all, a full metre - a hundred thousand mansheights - below Parz.

He felt the sole of a foot in his back. ‘Get on with it,’ Hosch growled. ‘It won’t kill you. Probably.’

Farr put his shoulders to the circular hatch and pushed. It was heavy and stiff, and as he pushed he heard the scraping of the Corestuff hoops binding up the capsule as they slid away.

The hatch burst open, flying out of his reach. The Air outside the Bell was thick and glutinous, and it crowded into the cabin, overwhelming the thinner, clear Air within. The light of the cabin’s lamps seemed immediately dimmed.

Farr held his breath, his mouth clamped closed almost of its own accord. There was a pressure on his chest, as if the thicker Air were trying to force itself into his lungs through his skin. With an effort of will he dragged his lips apart. The cloying, purple Air forced its way into his throat; he could feel it on his lips, viscous and bitter. He heaved, expanding his lungs; the stuff burned as it worked through his capillaries.

So, after a brief few heartbeats of struggle, he was embedded in the underMantle. He raised his arms experimentally, flexing his fingers. His movements were unimpaired, but he felt weaker, sluggish. Perhaps the superfluid fraction of this Air was lower than in the true Mantle.

‘The hatch,’ Bzya said, pointing. ‘You’d better retrieve it.’ Bzya’s voice was obscured, as if he was speaking through a layer of cloth.

Farr nodded. He pushed his way out of the hatchway.

The yellow-purple Air was so thick it barely carried any illumination; it was as if he was suspended in a dark-walled bubble about four mansheights across. The Bell was suspended at the centre of the bubble, a drifting bulk. Beyond it the Spine was a wall, massive and implacable, its upper and lower extremes lost in the misty obscurity of the Air. Looking at the Spine now Farr could see cables of Corestuff wrapped around it and laid out along its length - cables which must provide a magnetic field like the Bell’s, to keep the Spine from itself dissolving in the lower underMantle. The Bell’s own cables snaked up and out of sight towards the world of the upper Mantle, a world which seemed impossibly distant to Farr.

The loose hatch was a short distance from him. He Waved to it easily enough, although the Air in which he was embedded was a cloying presence around him. He caught the hatch and returned it briskly to Bzya.

‘Now the berg,’ Hosch called. ‘Can you see it?’

Farr looked. There was a shape, lumpen, lodged between the Bell and the Spine. It was half a mansheight long, dark and irregular, like a growth on the clean, artificial lines of the Bell.

‘Don’t I need the ropes?’

‘Go and inspect the berg first,’ Hosch called. ‘See if it’s done us any damage.’

He took deep breaths of the stale Air and flexed his legs. It would take only a few strokes to Wave to the lump of Corestuff.

As he neared, he saw that the berg’s surface was made rough by small pits and escarpments. It was hard to imagine that this was the material that formed the gleaming hoops around the Bell, or the City’s anchor-bands, or the fine inlays in Surfboards. He was within an arm’s length of the berg, still Waving smoothly . . . If he lived long enough, he would like to see the workshops - the foundries, Bzya called them - where the transformation of this stuff took place . . .

Invisible hands grabbed his chest and legs, yanking him sideways. He found himself tumbling head over heels away from the Bell. He cried out. He scrabbled at the Air but could gain no purchase, and his legs thrashed at the emptiness in a futile effort to Wave.

Trembling, he paddled at the Air, trying to still his roll. Hosch was laughing at him, he realized; and Bzya, too, seemed to be having trouble suppressing a smile.

Just another little game, then; another test for the new boy.

He closed his eyes, willing the trembling of his limbs to still. He tried to think. *Invisible hands?* Only a magfield could have jolted him like that - the Bell's protective magfield. And of course he'd been knocked sideways; that was the way fields affected moving charged objects, like his body. That was why it was necessary, when Waving, to move legs and arms *across* the flux lines of the Magfield to generate forward motion.

So the Bell's own magfield shell had thrown him. Big joke.

Logue would probably have told him off for not anticipating this, he realized. Laughed at him as well, to drive home the point.

Farr's fear turned to anger. He looked forward to the day when he would no longer have so much to learn . . . and he could maybe administer a few lessons of his own.

His self-control returning, Farr began to make his clumsy way back to the Bell. 'Give me the ropes,' he said.

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12

The huge lumber caravan was visible for many days before it reached Qos Frenk's ceiling-farm.

Dura, descending from a wheat-field at the end of a shift, watched the caravan's approach absently. It was a trace of darkness on the curving horizon, a trail of tree trunks toiling through the vortex lines from the wild forests on the upflux fringe of the hinterland, on its way to the City at the furthest downflux. She wasn't too interested. The hinterland sky, even this far from Parz, was never empty of traffic. The caravan would pass in a couple of days, and that would be that.

But this caravan didn't go by so quickly. As time wore on it continued to grow in her vision, and Dura slowly came to appreciate the caravan's true scale, and the extent to which distance and perspective had fooled her. The train of severed tree trunks, stretched along the vortex lines, must have extended for more than a centimetre. And it was only when the caravan approached its nearest point to the farm that Dura could make out people travelling with the caravan - men and women Waving along the lengths of the trunks, or tending the teams of Air-pigs scattered along the trunks' lengths, utterly dwarfed by the scale of the caravan itself.

Another shift wore away. Rubbing arms and shoulders left stiff by a long day's crop-tending, Dura slung her Air-tank over her shoulder and Waved slowly towards the refectory.

Rauc came up to her. Dura studied her curiously. Rauc had become something of a friend to Dura - as much of a friend as she had made here, anyway - but today the slim little coolie seemed different. Distracted, somehow. Although Rauc too had just finished a shift, she'd already changed into a clean smock and combed her hair free of dirt and wheat-chaff. The smile on her thin, perpetually tired face was nervous.

'Rauc? Is something wrong?'

'No. No, not at all.' Rauc's small feet twisted together in the Air. 'Dura, have you got any plans for your off-shift?'

Dura laughed. 'To eat. To sleep. Why?'

'Come with me to the caravan.

'What?'

‘The lumber caravan.’ Rauc pointed down beneath her feet, to where the caravan toiled impressively across the sky. ‘It wouldn’t take us long to Wave down there.’

Dura tried to conceal her reluctance. *No thanks. I’ve already seen enough of the City, the hinterland, of new people, to last me a lifetime*. She thought with a mild longing of the little nest she’d been able to establish for herself on the fringe of the farm - just a cocoon, and her little cache of personal belongings, suspended in the open Air, away from the cramped dormitories favoured by the rest of the coolies. ‘Maybe another time, Rauc. Thanks, but . . .’

Rauc looked unreasonably disappointed. ‘But the caravans only pass about once a year. And Brow can’t always arrange an assignment to the right caravan; if we’re unlucky he ends up centimetres away from the farm when he passes this latitude, and . . .’

‘Brow?’ Rauc had mentioned the name before. ‘Your husband? Your husband’s with this caravan?’

‘He’ll be expecting me.’ Rauc reached out and took Dura’s hands. ‘Come with me. Brow’s never met an upfluxer before.’

Dura squeezed her hands. ‘Well, I’ve never met a lumberjack. Rauc, is this the only time you get to see your husband? Are you sure you want me along?’

‘I wouldn’t ask otherwise. It will make it special.’

Dura felt honoured, and she said so. She considered the distance to the caravan. ‘Will we have the time to get there and back, all in a single off-shift? Maybe we ought to go to Leeh and postpone our next shift - do a double.’

Rauc grinned. ‘I’ve already fixed it. Come on; find yourself something clean to wear, and we’ll go. Why don’t you bring your stuff from the upflux? Your knife and your ropes . . .’

Rauc followed Dura to her sleeping-nest, talking excitedly the whole way.

The two women dropped out of the ceiling-farm and descended lightly into the Mantle.

Dura dipped forward, extending her arms towards the caravan, and began to thrust with her legs. As she Waved she was still wondering if this was a good idea - her legs and arms still ached from her long shift - but

after some time the steady, easy exercise seemed to work the pains from her muscles and joints, and she found herself relishing the comfortable, natural motion across the Magfield - so different from the cramped awkwardness of her work in the fields, with her head buried in an Air-mask, her arms straining above her head, her fingers thrust into the roots of some recalcitrant mutant plant.

The caravan spread out across the sky before her. It was a chain of Crust-tree trunks stripped of roots, branches and leaves; the trunks were bound together in sets of two or three by lengths of rope, and the sets were connected by more links of strong plaited rope. Dura had to swivel her head to see the leading and trailing ends of the chain of trunks, which dwindled with perspective among the converging vortex lines; in fact, she mused, the whole caravan was like a wooden facsimile of a vortex line.

Two humans hung in the Air some distance from the caravan. They seemed to be waiting for Rauc and Dura; as the women approached they called something and set off through the Air to greet them. It was a man and a woman, Dura saw. They were both around the same age as Rauc and Dura, and they wore identical, practical-looking loose vests equipped with dozens of pockets from which bits of rope and tools protruded.

Rauc rushed forward and embraced the man. Dura and the lumberjack woman hung back, waiting awkwardly. The woman was slim, strong-looking, with tough-looking, weathered skin; she - and the man, evidently Rauc's husband Brow - looked much more like upfluxers than any hinterland or City folk Dura had met up to now.

Rauc and Brow broke their embrace, but they stayed close with their arms linked together. Rauc pulled Brow towards Dura. 'Brow, here's a friend from the farm. Dura. She's an upfluxer . . .'

Brow turned to Dura with a look of surprised interest; his gaze flickered over her. He resembled Rauc quite closely. His body was lean, strong-looking under its vest, and his narrow face was kindly. 'An upfluxer? How do you come to be working on a ceiling-farm?'

Dura forced herself to smile. 'It's a long story.'

Rauc squeezed Brow's arm. 'She can tell you later.'

Brow rubbed his nose, still staring at Dura. 'We see upfluxers sometimes. In the distance. When we're working in the far upflux, right at

the edge of the hinterland. You see, the further upflux you go towards the wild forests, the better the trees grow. But . . .' He stopped, embarrassed.

'But the more dangerous it gets?' Dura maintained her smile, determined for once to be tolerant. 'Well, don't worry. I don't bite.'

They laughed, but it was forced.

Rauc introduced the woman with Brow. She was called Kae, and she and Rauc embraced. Dura observed them curiously, trying to make sense of their relationship. There was a stiffness between Rauc and Kae, a wariness; and yet their embrace seemed genuine - as if on some level, beneath the surface strain, they shared a basic sympathy for each other.

Brow tugged at Rauc. 'Come and see the others; they've missed you. We're going to eat shortly.' He glanced at Dura. 'Will you join us?'

The woman Kae approached Dura with brisk friendliness. 'Dura, let's leave these two alone for a while. I'll show you around the caravan . . . I don't suppose you've met people like us before . . .'

Dura and Kae Waved side by side along the length of the caravan. Kae pointed out features of the caravan and described how it worked in a brisk, matter-of-fact way, her talk laced with endless references to Dura's assumed ignorance. Dura had long since grown tired of being treated as an amusing freak by these Parz folk, but - for today - she bit back the acid replies which seemed to come so easily to her. This woman, Kae, didn't mean any harm; she was simply trying to be kind to a stranger.

Maybe I'm learning to look beneath the surface of people, Dura wondered. *Not to react to trivia*. She smiled at herself. Maybe she was growing up at last.

The chain of trunks slid through the Air at about half an easy Waving speed. There were teams of harnessed Air-pigs, their harness sets fixed - not to Air-cars - but to the rope links in the chain of trees. The pigs squealed and snorted as they hauled at their restraints of leather. Humans, some of them children, tended the animals. The pigs were fed bowls of mashed-up Crust-tree leaf, and their harnesses were endlessly adjusted to keep the teams hauling in the same direction, along the long line of trunks.

People hailed Kae as she passed, and they glanced curiously at Dura. Dura guessed there must be a hundred people travelling with this caravan.

The women paused to watch one team being broken up. The animals were released from their harnesses, but they were still restrained by ropes

fixed to pierced fins. The animals were led away to be tied up in another part of the caravan to rest, while a fresh team was fixed into place.

Dura frowned at this. ‘Wouldn’t it be easier to stop the caravan, rather than try to change the pigs over in flight?’

Kae laughed. ‘Hardly. Dura, when the caravan is assembled, back on the edge of the upflux, it takes several days, usually, for the pig-teams to haul it up to speed. And once this mass of wood is moving, it’s much easier to maintain its motion than to keep stopping and starting it. Do you see?’

Dura sighed inwardly. ‘I know what momentum is. So you don’t even stop when you sleep?’

‘We sleep in shifts. We sleep tied up to nets and cocoons fixed to the trunks themselves.’ Kae pointed to the nearest pig-team. ‘We rotate the pigs in flight. It isn’t so difficult to steer a caravan; all you have to do is follow the vortex lines downflux until you get to the South Pole . . . Dura, a caravan like this never stops moving, once it sets off from the edge of the hinterland. Not until it’s within sight of Parz itself. Then the pig-teams are turned around, and the caravan’s broken up to be taken into the City.’

Dura tried to envisage the distance from the upflux to Parz. ‘But at this speed it must take months to reach the City.’

‘A full year, generally.’

‘A year?’ Dura frowned. ‘But how can the City wait that long for lumber?’

‘It can’t. But it doesn’t have to.’ Kae was smiling, but there didn’t seem to be any impatience in her tone at Dura’s slowness. ‘At any time, there’s a whole stream of caravans like this, heading for the City from all around the circumference of the hinterland. From the point of view of Parz there’s a steady flow of the wood it needs.’

‘Rauc knew on exactly which day to come down to the caravan. In fact, you and Brow were waiting to greet us.’

‘Yes. We were on time. We always are, Dura; all the caravans are, right across the hinterland. It’s all carefully planned.’

Dura thought of dozens, hundreds perhaps, of caravans like this, endlessly converging on Parz with their precious lumber . . . and all *on time*. She felt awed at the idea of humans being able to plan and act systematically on such a scale, and with such precision.

They moved on along the length of the caravan. In some places the trunks had been opened up to expose the green glow of the wood's nuclear-burning core. Humans moved around the glowing spots and circles, purposeful and busy. There were nets and lengths of rope trailing from the trunks, and Dura saw sleep cocoons, tools, clothes, food bales tucked into the nets. In one place there was a little clutch of infants and small children, safely confined inside a fine-meshed net.

'Why,' she said, 'the caravan's like a little City in itself. A City on the move. There are whole families here.'

'That's right.' Kae smiled, a little sadly. 'But the difference is, it's a City that will be broken up in another few months, when we get to Parz. And we'll be shipped back to the hinterland in cars, to start work on another.'

They passed another netful of sleeping children.

Dura asked gently, 'Why doesn't Rauc travel with the caravan? With Brow?'

Kae stiffened slightly. 'Because she gets better pay where she is, doing coolie-work for Qos Frenk. They have a kid. Did she tell you? She and Brow are having her put through school in Parz itself. They have to work like this, to afford the fees.'

Dura let herself drift to a stop in the Air. 'So Rauc is on a ceiling-farm in the hinterland, her child is in that wooden box at the Pole, and Brow is lost somewhere in the upflux with the lumber caravans. And if they're lucky they meet - what? once a year?' She thought of the Mixxaxes, also constrained to spend so much of their time apart, and for much the same motives. 'What kind of life is that, Kae?'

Kae drew away. 'You sound as if you disapprove, Dura.' She waved a hand. 'Of all of this. The way we live our lives. Well, we can't all live as toy savages in the upflux, you know.' She bit her lip, but pressed on. 'This is the way things are. Rauc and Brow are doing the best they can, for their daughter. And if you want to know how they feel about so much separation, you should ask them.'

Dura said nothing.

'Life is complex for us - more than you can imagine, perhaps. We all have to make compromises.'

'Really? And what's your compromise, Kae?'

Kae’s eyes narrowed. ‘Come on,’ she said. ‘Let’s find the others. It must be time to eat.’

They worked their way back along the complicated linear community in stiff silence.

A dozen people had gathered, close to the trunk of one of the great severed trees at the heart of the caravan. A Wheel design had been cut into the trunk: neat, five-spoked, large enough to curve around the trunk’s cylindrical form. Small bowls of food had been jammed into the glowing trenches of the design.

The people anchored themselves to the trunk itself, or to ropes and sections of net dangling from the trunk, arranging themselves around the glow of the nuclear fire. Occasionally one of them reached into the fire and drew out a bowl.

Dura joined the group a little nervously. But she was greeted by neutral, even friendly nods. With their nomadic lives, criss-crossing the hinterland, these caravanners must be as used to accepting strangers as anyone in the huge, sprawling hinterland around Parz.

She found a short length of rope and wrapped it around her arm. The rope, leading to the tree trunk, hauled at her with a steady pressure. So, she realized, she had become part of the caravan, bound to it and swept along by its immense momentum. She glanced around at the group. Their faces, their relaxed bodies in their practical vests, formed a rough hemispherical shell over the exposed wood core. The green glow underlit their faces and limbs and cast soft light into their eyecups. Dura felt comfortable - accepted here - and she drifted closer to the warmth of the nuclear fire.

She spotted Rauc and Brow, huddled together on the far side of the little group. Rauc waved briefly to her, but quickly returned her attention to her husband. Glancing around discreetly, Dura saw that most of the party had separated out into couples, bonded loosely by conversation. Alone, she turned to stare into the steady glow of the fire.

There was a tap on her arm. She turned. Kae had settled into place next to her. She was smiling. ‘Will you eat?’

Dura couldn’t help but glance around surreptitiously. There seemed to be no one with Kae, no partner. There was no sign of Kae’s earlier flash of hostility - she had the impression that there was a core of deep unhappiness

in Kae, hidden not far beneath the surface. She smiled back, eager to show good grace. ‘Thanks. I will.’

Kae reached towards the fire-trenches cut into the wood. She drew out one of the bowls embedded there, taking care to keep her fingers away from the hot wood itself. The bowl was a small globe carved of wood, and it held food, a dark brown, irregular mass. She held the bowl out to Dura.

Dura reached into the bowl and poked at the food tentatively. It was hot to the touch. She took hold of it and drew it out. The surface was furry, but the furs were singed to a crisp, and they crackled as she squeezed.

She looked at Kae doubtfully. ‘What is it?’

‘Try it first.’ Kae looked sly in the green underglow.

Dura picked at the fur. ‘The whole thing?’

‘Just bite into it.’

Dura shrugged, raised the lump briskly, opened her mouth wide and bit into the fur. The surface was elastic, difficult to pierce with her teeth, and the furs tickled the roof of her mouth. Then the skin broke, and bits of hot, sticky meat spurted over her mouth and chin. She spluttered, but she wiped her face and swallowed. The stuff was rich, warm, meaty. She took a bite from the skin and chewed it slowly. It was tough and without much flavour. Then she sucked at the remaining meat inside the shell. There was a hard inner core which she discarded.

‘It’s good,’ she said at last. ‘What is it?’

Kae let the empty bowl hang in the Air; she poked at it with her forefinger and watched it roll in the Air. ‘Spin-spider egg,’ she said. ‘I knew you wouldn’t recognize it. But it’s the only way to eat it. It’s actually a delicacy, in some parts of the hinterland. There’s even a community on the edge of the wild forest who cultivate spiders, to get the eggs. Very dangerous, but very profitable. But you have to know how to treat the eggs, to bring out the flavour.’

‘I don’t think I would have recognized this as a spider egg at all.’

‘It has to be collected when freshly laid - when the young spider hasn’t yet formed, and there’s just a sort of mush inside the egg. The hard part in the centre is the basis of the creature’s exoskeleton; the young spider grows into its skeleton, consuming the nutrient.’

‘Thanks for telling me,’ Dura said dryly.

Kae laughed, and opened up a sack at her waist. She drew out a slice of beercake. ‘Here; have some of this. In Parz, there’s a good market for exotic deep-hinterland produce like that. We make a good side-profit from it. Now. How about some Air-pig meat?’

‘All right. Please. And then you can tell me how you came to join these lumber caravans.’

‘Only if you tell me how you ended up here, so far from the upflux . . .’

With food warm inside her, and with the exhilarating buzz of beercake filling her head, Dura told Kae her tangled story; and a little later, in the steady glow of the nuclear-fire Wheel, she repeated her tale for the rest of the lumberjacks, who listened intently.

The food globes, nestling in the fire trenches, were finished. The conversation gradually subsided, and Dura sensed that the gathering was coming to an end.

Rauc drew her hand from her husband’s, and pulled forward, alone, into the centre of the little group. She faced the Wheel cut into the tree trunk in silence.

The last trickles of conversation died. Dura watched, puzzled. The atmosphere was changing - becoming more solemn, sadder. The lumberjacks drew away from each other, their postures stiffening in the Air. Dura glanced at Kae’s face. The lumberjack’s eyecups were wide, illuminated by the fire-glow, fixed on Rauc.

Slowly Rauc began to speak. Her words consisted of names - all of them unknown to Dura - recited in a steady monotone. Rauc’s voice was tired, quiet, but it seemed to enfold the intent gathering. Dura listened to the lulling, rhythmic chant of names as it went on, for heartbeat after heartbeat, read evenly by Rauc to the great Wheel carved into the wood.

These were the names of victims, Dura realized slowly. Victims of what? Of cruelty, of disease, of starvation, of accident; they were the names of the dead, remembered now in this simple ceremony.

Some of the names must go back generations, she thought, their deaths so ancient that all details had been forgotten. But the names remained, preserved by this gentle, graceful Wheel cult.

And people who lived in the sky could have no other memorial than words.

At last the list came to a close. Rauc hung in the Air before the fading glow of the Wheel trenches, her face empty. Then she stirred and looked around at the faces watching her, as if waking up. She Waved back to her husband.

The group broke up. Brow enfolded his wife in his arms and led her away. All around the group, couples bid farewells and drifted off.

Dura observed Kae surreptitiously. The woman was watching Brow and Rauc, her expression blank. She became aware of Dura. She smiled, but her voice sounded strained. ‘I’ve the feeling you’re judging me again.’

‘No. But I think I understand your compromises now.’

Kae shrugged. ‘We’re together, Brow and I, for most of the time. Rauc knows it, and has to live with that. But Brow - *loves* - Rauc. This day with her is worth a hundred with me. And I have to live with *that*. We all have to compromise, Dura. Even you.’

Dura thought of Esk, long dead now, and a similar painful triangle. ‘Yes,’ she said. ‘We all have to compromise.’

Kae offered her a place to sleep, somewhere in the tangle of nets and ropes that comprised this strange, linear City. Dura refused, smiling.

She said farewell to Kae. The lumberjack nodded, and they regarded each other with a strange, calm understanding.

Dura pushed away from the trunk and kicked at the Air, Waving for the ceiling-farm and her secure, private little nest.

The caravan spread out beneath her, Wheel-shaped fires burning in a dozen places.

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13

Accompanied by a nervous-looking nurse from the Hospital of the Common Good, the injured old upfluxer diffidently entered the Palace Garden. When Muub spotted him he beckoned to the nurse - over the heads of curious courtiers - that she should bring the upfluxer to join him at the Fount. Then he turned back to the slow ballet of the superfluid fountain.

The Garden was a crown perched atop Parz City, an expensive setting for the Palace of the City Committee. The Garden had been established generations before by one of the predecessors of Hork IV. But it had been the particular genius of the current Chair, and his fascination for the natural world around him, that had made this place into the wonder it was. Now it was a lavish park, with exotic plants and animals from all around the Mantle brought together in an orderly, tasteful display. The low - but extravagant - buildings which made up the Palace itself were studded around the Park, gleaming like Corestuff jewels set in rich cloth. Courtiers drifted through the Garden in little knots, huddling like groups of brightly coloured animals.

Muub was no lover of the great outdoors, but he relished the Garden. He tilted back his stiff neck, looking up into the yellow-gold Air. To be here beneath the arching, sparkling vortex lines of the Pole - and yet securely surrounded by the works of man - was a fulfilling, refreshing experience. It seemed to strengthen his orderly heart that the Garden was an artifact, a museum of tamed nature - but an artifact which stretched for no less than a square centimetre around him . . . The Garden was enough to make one believe that man was capable of any achievement.

He ran a discreet doctor’s eye over the approaching upfluxer. Adda was recovering well but he could still barely move without assistance. Both his lower legs were encased in splints, and his chest was swathed in bandages; a cast of carved wood enclosed his right shoulder. His head, too, was a mass of strapped-up cloth, and an eye-leech patiently fed in the corner of the old fellow’s only working eye.

‘I’m glad you could join me,’ Muub greeted him with a professional smile. ‘I wanted to talk to you.

Adda glowered past his leech at Muub’s shaved head, his finery. ‘Why? Who or what are you?’

Muub allowed himself a heartbeat's cold silence. 'My name is Muub. I am Physician to the Committee . . . and Administrator of the Hospital of the Common Good, where your injuries have been treated.' He decided to go on the offensive. 'Sir, we met before, when you were first carried into the Hospital by one of our citizens. On that occasion - though I don't expect you to remember - you told me to "bugger off". Well, I failed to accept that invitation, choosing instead to have you treated. I have asked you to view the Garden today as my guest, as a friendly gesture to one who is new to Parz and who is alone here. But frankly, if you're not prepared to be courteous then you are free to depart.'

'Oh, I'll behave,' Adda grumbled. 'Though I'll not swallow the pretence that you've done me any sort of favour by treating my injuries. I know very well that you're exacting a handsome price from the labour of Dura and Farr.'

Muub frowned. 'Ah, your companions from upflux. Yes, I understand they have found indentures.'

'Slave labour,' Adda hissed.

Muub made himself relax. Anyone who could survive at the court of Hork IV could put up with a little goading from an eyeless old fool from the upflux. 'I'll not let you needle me, Adda. I've invited you here to enjoy the Garden - the spectacle - and I fully intend that that is how we will spend the day.'

Adda held his stare for a few moments; but he did not pursue the discussion, and turned his head to view the Fount.

The superfluid fountain was the centrepiece of the Garden. It was based on a clearwood cylinder twenty microns across, fixed to a tall, thin pedestal. Inside the cylinder hovered a rough ball of gas, stained purple-blue, quivering slowly. The cylinder - fabulously expensive in itself, of course - was girdled by five hoops of polished Corestuff, and it bristled with poles which protruded from its surface. Barrels - boxes of wood embossed with stylized carvings of the heads of Hork IV and his predecessors - were fixed to the ends of the poles inside the cylinder.

Beautiful young aerobats - male and female, all naked - Waved spectacularly through the Air around the cylinder, working its elaborate mechanisms. The electric blue of the vortex lines cast shimmering

highlights from the clearwood, and the soft, perfect skin of the aerobats glowed with golden Air-light.

The upfluxer, Adda, made a disgusting noise through his nose. ‘You brought me here to see this?’

Muub smiled. ‘I wouldn’t expect you to understand what you’re seeing.’

Adda scowled, his hostility evident. ‘Then tell me.’

‘Superfluidity.’ Muub pointed. ‘The cylinder contains a low-pressure region. There’s hardly any Air in there, I mean . . . except for the sphere in the centre. That’s just Air, but stained blue so you can see it. The hoops around the cylinder, there, are generating a localized magnetic field. Do you understand me? Like the Magfield, but artificial. Controllable. The magnetic field keeps the cylinder from being crushed by the pressure of the Air outside. And it’s designed to keep the little Air inside the cylinder in that ball at the centre.’

‘So what?’

‘So we can view the Air - within which we are ordinarily immersed - from the outside, as it were.

‘Adda, Air is a neutron superfluid - a quite extraordinary substance which, were inhabitants of some other world to discover it, would seem miraculous. Quantized circulation - the phenomena which causes all the spin in the Air to collect into vortex lines - is only one aspect. Watch, now, as the vessels are lowered and raised from the sphere of Air.’

A handsome young aerobat - a girl with blue-dyed hair - grasped one of the poles protruding from the cylinder and pushed it through the clearwood wall. The base of the ornate barrel at its far end dipped into the sphere of blue Air. The barrel wasn’t completely immersed; the girl held the barrel still so that its rim protruded from the surface of the Air by a good two or three microns.

Blue-stained Air visibly crawled up the sides of the box and over the lip, pooling inside. It was like watching a living creature, Muub thought, fascinated and charmed as always by the spectacle.

When the box had filled itself to the level of the rest of the sphere, the aerobat drew it slowly out of the sphere and brought it to rest again, so that its base was placed perhaps five microns above the surface. Now the blue Air slid over the sides and, in a thin stream which poured from the base of the vessel, returned eagerly to the central sphere.

The aerobat troupe maintained this display at all hours of the day, at quite remarkable expense. Adda watched the cycle through a couple of times, his good eye empty of expression.

Muub watched him surreptitiously, then shook his head. ‘Don’t you have any interest in this? Even your eye-leech is showing more awareness, man!’ He felt driven, absurdly, to justify the display. ‘The Fount is demonstrating superfluidity. When the vessel is lowered into the pool, a thin layer of the fluid is adsorbed onto the vessel’s surface. And the Air uses that fine layer - just a few neutrons thick - to gain access to the interior of the vessel. When the vessel’s withdrawn the Air uses the same channel to return to the main bulk, the sphere. Quite remarkable.

‘The hoops maintain a slight magnetic gradient from the geometric centre of the cylinder. That gradient restricts the residual Air to that sphere at the centre . . . and it is the resulting difference in electromagnetic potential energy which drives the cycle of the fountain. And . . .’ ‘Riveting,’ Adda said dryly.

Muub bit back a sharp comment. ‘Well, I know you people have different priorities in life. Let’s view the rest of the Garden . . . perhaps some of it will remind you of the world you have left behind. I’m curious as to how you lived, actually.’

‘We *upfluxers*?’ Adda asked acidly.

Muub replied smoothly, ‘You Human Beings. For example, superfluidity . . . Have you retained much knowledge of such matters?’

Adda said, ‘Much of the lore absorbed by our children is practical and everyday . . . how to repair a net; how to keep yourself clean; how to turn the battered corpse of an Air-pig into a meal, a garment, a source of weapons, a length of rope.’

Muub felt himself shudder delicately.

‘But knowledge is our common heritage, City man,’ Adda murmured. ‘We would scarcely allow you to rob us of that, as you robbed us of our place here ten generations ago.’

Turning, Muub led Adda slowly away from the Fount. Beside the youthful grace of the aerobats, Adda’s ungainly stiffness was laughable - and yet heart-breaking, Muub thought. They passed through one of Hork’s experimental ceiling-farm areas. Here a new strain of wheat - tall and fat-stemmed - thrust from a simulated section of Crust-forest root-ceiling.

‘Tell me, Adda. What are your plans now?’

‘Why should you care?’

‘I’m curious.’

Adda was silent for a while; then, grudgingly, he replied: ‘I’m going to go back. Back to the upflux. What else?’

‘And how do you propose to achieve that?’

‘I’ll damn well Wave there if I have to,’ Adda growled. ‘If I can’t get one of your *citizens* to take me home in one of those pig-drawn cars you have.’

Muub was tempted to mock. He tried to summon up sympathy, to put himself in Adda’s situation - alone and far from home in a place he must find frighteningly strange, despite his bravado. ‘My friend,’ he said evenly, ‘with all respect to the skills of my staff in the Common Good, and to the remarkable progress you are making . . . I have to say it will be a long time before you are fit for such a journey. Even by car, the trek would kill you.’

Adda snarled. ‘I’ll take my chance.’

‘And, if you made it home you’d never be as strong as you were, frankly. Your pneumatic system has been weakened to well below its nominal level.’

Adda’s response, when it came, seemed doubtful. ‘I couldn’t hunt?’

‘No,’ Muub shook his head firmly. ‘Even if you were able to Wave fast enough to creep up on, let us say, an aged and unfit Air-pig . . .’ - that won a slight smile from the upfluxer - ‘even so, you could never survive the low pressures, the thin Air of the upper Mantle. You see, you would be a burden on your people if you returned. I’m sorry.’

Adda’s anger was apparently directed inwards now. ‘I will not be a burden. I wanted to die, after my injury. You did not allow me to die.’

‘It was the choice of your companions. *They* did not allow you to die; they sold their labour to pay for your continued health. Adda, you owe it to them to maximize the usefulness of your new life.’

Adda shook his head stiffly, the bandaging rustling at his neck. ‘I cannot return home. But I have nothing here.’

‘Perhaps you could find work. Anything you could earn would reduce the burden on your friends.’ . . . And help besides, Muub forbore to add, to pay for Adda’s own food and shelter once his medical treatment was concluded.

‘What could I do? Do you hunt here? I can’t see myself being much use stalking blades of mutated grass.’

They had come now to a simulation of the wild Crust-forest. Dwarf Crust-trees - slender whips no taller than a mansheight - thrust out of the roof of Parz. A clutch of young ray, shackled to the roof surface by short lengths of rope, snapped at them as they passed. Muub glanced at Adda, curious about the old man’s reaction to this toy forest. But Adda had turned his face up to the vortex lines swooping over the City; his good eye was half-closed, as if he were peering at something, and the leech crawled, ignored, over his face.

Muub hesitated. ‘When I first encountered you, you were swaddled in make-shift bandages. And you had splints . . . Do you remember? The splints seemed actually to be spears, of varying lengths and thicknesses. All decorated with fine engravings.’

‘What of it? Are you suggesting I could get a price for them here? I thought your people, your *Guards*, were well enough equipped with their bows and whips.’

‘Indeed. No, we do not need your weapons . . . as *weapons*. But as artifacts the spears have a certain - novelty.’ Muub sought the right words. ‘A kind of primitive artistry that is really rather appealing. Adda, I suspect you could get a decent price for your artifacts, especially from collectors. And if, by chance, you were capable of producing more . . .’

There was an odd change in the quality of light around them. Muub glanced around, half-expecting to find that they had fallen into the shadow of an Air-car; but the sky was empty, save for the vortex lines. Still the feeling of change persisted, though, unsettling Muub; he pulled his robe closer around him.

Adda laughed. ‘I’d rather die than whore myself.’

Muub opened his mouth, shaping a reply. *That may be the choice, old man* . . . But now there was some sort of disturbance among the courtiers around them. No longer drifting in their intense little knots of intrigue, the courtiers were gathering together as if for comfort, pointing at the sky. ‘I wonder what’s wrong. They seem scared.’

‘Look up,’ Adda said dryly. ‘Perhaps that has something to do with it.’

Muub looked into the old man’s sour, battered face, and then lifted his head to the open Air.

The flux lines were moving. They were surging upwards, away from the City, rising like huge knife-blades towards the Crust.

‘*Glitch*,’ Adda said, his voice tight. ‘Another one. And a bad one. Muub, you must do what you can to protect your people.’

‘Is the City in danger?’

‘I don’t know. Perhaps not. But those in the ceiling-farms certainly are . . .’

Muub, in the last moment before rushing to his duties, found time to remember that Adda’s own people too were exposed to all of this, lost somewhere in the sky.

The Air above him seemed to shimmer; somewhere a courtier screamed.

It was Rauc who first noticed the change in the sky.

Dura and Rauc were working together in a corner of Qos Frenk’s ceiling-farm. Dura was wearing the mandatory Air-tank, but she wore the veil pushed back from her face; and the heavy wooden tank thumped against her back as she worked. She had pushed her head and shoulders high into the stems of wheat, so that she was surrounded by a bottomless cage of the yellow-gold plants. She reached above her head with both hands, burrowing with her fingers among the roots of the wheat. Stems scratched her bare arms. Here was another sapling; it felt warm and soft, undeniably a living thing, a thin thread of heavy-nuclei material pulsing along its axis. Young Crust-trees were the most persistent danger to Frenk’s crop, springing up endlessly despite continual weeding. The saplings - thinner than a finger’s width - were difficult to see, but easy to pick out from among the wheat-stems by touch. She allowed her fingers to track along the sapling’s length further up into the shadows of the wheat. She probed at its roots, which snaked up into the tangle of roots and plants which comprised the forest ceiling, and patiently prised them out.

It was dull, mindless work, but not without a certain satisfaction: she enjoyed the feel of the plants in her fingers, and relished deploying the simple skills she was learning. Maybe in some other life she might have been a good farmer, she thought. She liked the orderliness of the farm - although not the pressure of other people - and the work was simple enough to leave her mind free to wander, to think of Farr, of the upflux, and . . .

Rauc half-laughed. ‘Look at that. Dura, look . . . How strange.’

Vaguely irritated at this irruption into her daydream, Dura dropped down from the inverted field. Emerging into the clear Air, she rubbed her hands free of dust. ‘What is it?’

Rauc hovered in the Air, Waving gently; she pointed downwards. ‘Look at the vortex lines. Have you ever seen them behave like that before?’

Vortex lines, acting strangely?

Dura snapped her head downwards and raked her gaze across the sky.

The vortex lines were *shimmering* - infested with so many small instabilities that it was difficult to see the lines themselves. At the limit of vision Dura could just make out individual ripples racing along the lines, like small, scurrying animals. And the lines were exploding upwards, out of the Mantle and towards the Crust. Towards the farm. Towards her.

All of the lines were moving, as deep into the sky as she could see; the parallel ranks of them hurtled evenly out towards her.

There was something else, too: a dark shape far away, at the edge of her peripheral vision; it scored the yellow horizon with a pencil of blue-white light.

‘Rauc,’ she said. ‘We have to move.’

Rauc looked up at her, the thin, tired face beneath its veiled hat registering unconcern. ‘Why? What’s wrong?’

Dura brushed the hat from her head, impatiently shrugging off the straps of her Air-tank. ‘Give me your hand.’

‘But why . . .’

‘It’s a Glitch. And if we don’t move now we’ll be killed. Give me your hand. Now!’

Rauc’s mouth opened wide. Dura saw shock in her expression, but no fear yet. Well, there would be time enough for that. She grabbed Rauc’s hand; the labourer’s palm was toughened by her work but the hand was cool, free of the heat of terror. She kicked at the Magfield with both legs, Waving downwards, away from the Crust and towards the approaching flux lines. At first Rauc was dead inertia behind her; but after a few strokes Rauc, too, began to Wave.

When the Star suffered a Glitch the Mantle could not sustain its even, gently slowing pattern of rotation. The superfluid Air tried to expel the excess rotation from its bulk by pushing the arrays of vortex lines - lines of

quantized vorticity - out towards the Crust. And the lines themselves suffered instabilities, and could break down . . .

The women dropped into the racing forest of vortex lines. The lines were usually about ten mansheights apart, so - in normal times - they were easy to avoid. But now, at the birth of this spin storm, they were already rising faster than a Human Being could Wave. The vortex lines fizzed past the women, sparkling electric blue. Instabilities the size of a fist raced along them, colliding, merging, collapsing.

Rauc whimpered. Unwelcome images of the last Glitch, of Esk imploding around the rogue vortex line, crowded Dura's head. She concentrated on the buffeting of the Air against her bare skin, the thin, unnatural taste of it on her lips, the deadly sparkle of the vortex lines. *Now* was all that mattered - now, and surviving into the future through this moment.

The vortex lines were growing denser as they crowded towards the Crust, seeking an impossible escape from the Star. It was becoming harder to dodge the lines as they swept past her like infinite blades; she was forced to twist backwards and forwards, slithering between lines. The instabilities were becoming more prominent, too; now ripples almost a mansheight high were marching along the soaring lines, deepening and quickening as they passed. There was a terrible beauty in the way the complex waveforms sucked energy from the vortex lines and surged forwards. The Air was filled with the deafening, deadening heat-roar of the lines.

Soon Dura's arms and legs, already stiff from a long shift, were aching, and the Air seemed to scrape through her lungs and capillaries. But now, as they penetrated the rushing vortex forest and moved deeper into the Mantle, the lines were starting to thin out. Dura, gratefully, looked down and saw that they were approaching a volume where the lines - though still cutting the Air with preternatural speed - were spaced at about their normal density. Further in still the Air seemed almost clear of lines, temporarily purged of its vorticity.

Dura released Rauc's hand and risked a look back.

The vortex lines soared upwards into the Crust, slicing through nuclear matter and embedding themselves amid the complex nuclei of the Crust material. As they entered the forest ceiling the lines thrashed with instabilities, sending bits of broken matter flying into the Air. The lines

were tearing apart Qos Frenk's ceiling-farm. The crops she had tended only heartbeats earlier were now uprooted, fat wheat-stems scattered in the Air. Ironically, Dura could see Crust-tree saplings, anchored by their deeper roots to the forest ceiling, surviving the spin storm where the mutated grass could not.

Further away, the buildings at the heart of Frenk's farm had been torn loose of their moorings to the Crust ceiling; one of them exploded into a shower of wood splinters. Coolies and supervisors were emerging from the fields and buildings, all over the farm. They looked like a cloud of ungainly insects, dropping from the fields towards the hurtling spin lines. Even through the storm Dura could hear their shouts and cries; she wondered if the voice of Qos Frenk himself were among them. Some people squirmed desperately into the lethal rain of vorticity, as Dura and Rauc had done; but most had left it too late. Unable to squeeze through the barrage of twisting lines they were forced to turn back, to climb up towards the Crust.

But there was no haven there.

Dura saw a woman, her Air-mask still in place over her face, pull herself up into the wheat, as if burrowing into the Crust. When the vortex lines struck, her body folded around the lines, backwards, her arms and legs outstretched. The woman's cries rose, thin and clear, before cutting off sharply.

Dura concentrated on the light-smell of the disturbed Air, its sharp presence in her nostrils and on her palate and lips. She wasn't out of danger yet herself. She watched an instability emerge from a line close to her. The instability grew like a tumour and scythed through the Air, its motion along the line combining with the line's upward sweep to take it diagonally past her. As it exceeded a mansheight in depth the complex grace of its waveform became distorted; it seemed to be forming a neck at its base, and secondary instabilities rippled around its circumference like attendants.

The neck began to close. Dura stared, fascinated.

The sparkling vortex line crossed itself. The throat closed, and a ring of vorticity spun clear of the line, perhaps two mansheights in diameter. The line itself, freed of its irksome instability, recoiled from the ring in a smooth surge, and then soared on towards the Crust. The ring turned in the Air, quivering, cutting a diagonal path through the array of vortex lines.

A vortex ring.

Rings were believed to form perhaps once a generation, in extremes of spin weather. Dura had never seen one before, and as far as she knew neither had her father, in a long lifetime in the upflux.

She felt a prickle of deep unease. *A vortex ring. Something extraordinary is happening to the Star.*

She remembered the odd, distant movement she had seen at the start of the storm, the needles of blue light on the concave horizon. Perhaps that blue light was the cause of all this. Making sure she wasn't in any immediate danger, she glanced around the sky, seeking out the strange vision . . .

A scream. *Rauc.*

Dura spun in the Air, her legs thrashing at the Magfield. Rauc had gone from her side, unnoticed. She felt a surge of anger at herself, her own carelessness, her dreamy fascination with the vortex ring.

The scream had come from the path of the vortex ring, as it rose towards the Crust. There was Rauc, high up in the thinning, rushing forest of vortex lines. She must have seen the damage being wrought at the farm, and had taken it into her head to return. To help. And now she was right in the path of the climbing vortex ring. Rauc's eyes and her round, gaping mouth were like three splashes of dark paint on her round face. The older woman was hanging in the Air, mesmerized by the ring's oscillations, making no effort to flee.

Dura wrenched her legs and arms through the Air, surging towards the remote tableau. 'Get out of the way! Rauc, oh, get out of the way! It will kill you . . .'

But she could not overtake the ring. Rauc seemed to be waiting, almost patiently, for the ring to come to her. The Air scraped in Dura's mouth and throat. She clawed through the Air, her concern for patient, harmless Rauc merging with layers of savage memory: her desolation at the loss of Esk and her father, her continual, helpless ache at the thought of Farr, so remote from her.

A ring was a mechanism for a vortex line to shed instability, to lose excess energy in a bid to regain lost equilibrium. But the ring itself was unstable. It quivered in the Air as it climbed, seeming almost fragile, and it was visibly shrinking: already it had lost perhaps half its original diameter and was reduced to no more than a mansheight in width. And its path

curved in the Air, as its spin wrenched at the gas it passed through. For a moment Dura wondered wildly if the combined effects of the shrinkage and the deviation of its trajectory might take the ring away from Rauc. Perhaps if Rauc would just Wave a little way, away from the curve of the path . . .

No. It was too late. Rauc was still alive, fully breathing, aware; but it was as if she was already dead.

The ring struck Rauc in the midriff. She seemed to implode around the ribbon of vorticity. Her smock was torn open and dragged forward, exposing her back; Dura saw shards of bone protruding from broken flesh. One arm was twisted around and torn away, leaving a grisly, twisted stump of ligament and bone. Rauc's head remained intact, but it seemed to have been pulped; her face had been stretched, grotesquely, the mouth ripping at its corners.

The vortex ring passed on through the wreckage of Rauc, shrinking rapidly.

Dura let herself drift to a stop in a clear volume of Air. She felt the tension leave her muscles; she curled slowly into a ball, as if she were seeking sleep. *This shouldn't happen*, she thought. *It's not right. We don't deserve such a fate. It's - unnatural.*

And now there was another name to add to the litany of the caravans.

On the horizon, something moved. An object, slicing through the Air; it was like a ray, with shining, golden wings which beat at the Air . . . but it was far larger than any ray, large enough to be seen even though it was almost lost in the mists of the horizon. Blue-white light stabbed from the belly of the great sky-ray into the bruised purple mass of the Quantum Sea below.

More memories, legends from the mouths and staring eyecups of intense, lean old men, returned to her. *I know what that is. Could it be causing the Glitches, with those beams?*

I know what it, is. It's a ship, from beyond the Star.

She let her head sink forward, against her knees.

Xeelee.

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14

‘**X***eelee.’*

Amidst the wreckage of ceiling-farm buildings, Hork cradled the head of his father in his lap. He looked up at Muub, despair and rage shining from his bearded face.

Muub studied the broken body of Hork, Chair of Parz Committee, determined to forget his own personal danger - exposed as he was to the mercurial anger of the younger Hork - and to view this shattered man as just another patient.

As soon as word of the latest Glitch reached Parz, Hork, fearing for his father’s life, had summoned Muub. Now, less than a day later, here they were at the experimental Crust farm.

The small medical staff maintained here had clearly been overwhelmed by the disaster. They had greeted Muub on his arrival with a bizarre mixture of relief and fear - eager to hand over responsibility for the injured Chair, and yet fearful of the consequences if they were judged to be negligent. Well, the staff here had clearly done their best, and Muub doubted that the attention Hork had received could have been bettered even within his own Common Good Hospital. But the medics’ work had been to no avail, Muub saw immediately. The large, delicate skull of the Committee Chair was clearly crushed.

A Guard, crossbow loaded, hovered over the body, watching Muub surreptitiously.

Hork lifted his face to Muub; Muub read bitterness, apprehension and determination in Hork’s round, tough features. He tried to put aside the interest shown by the Guard in his movements. Hork was a grieving son, he told himself. ‘Sir,’ he said slowly. ‘He’s dead. I’m sorry. I . . .’

Hork’s eyecups seemed to deepen. ‘I can see that, damn you.’ He glanced over his father’s crushed body, picking at the Chair’s fine robes.

‘The staff here were afraid to tell you,’ Muub said.

‘Do they have reason to be?’

Muub tried to judge Hork’s mood. He was honest enough to admit to himself that he would have no compunction in delivering the hapless attendants here up to Hork’s wrath, if he thought it were necessary to save

himself. But Hork, though clearly shocked, seemed rational. And in his heart he wasn't a vindictive man. 'No. They did everything they could.'

Hork ran a hand over his father's thin, yellow hair. 'Make sure you tell them I appreciate their work. See they understand they're under no threat for their part in this . . . And see they get on with treating the rest of the injured here.'

'Of course.' There was plenty of work for the medics here. As the Air-chariot had hurtled beneath the devastated hinterland, Muub had caught shocking, vivid glimpses of smashed fields - of coolies and uprooted wheat-stems drifting alike in the placid Air - of shattered, exploded buildings. Air-pigs had nosed among drifting corpses, seeking food. He shuddered. 'I may be forced to stay here myself, sir, after you've departed. There is urgent work to be done, all around this area, finding and treating the wounded before . . .'

'No.' Hork still stroked his father's head, but his voice was brisk, businesslike. 'I intend to stay here one day, to ensure my father's affairs are in order. During that time you may do as you please here. But then I will return to Parz, and you must return with me.' He raised his face to the sky and stared around at the Crust, at the newly congealed vortex lines. 'The devastation is not restricted just to this farm, or even this part of the Crust. Muub, damage was done in a broad annulus right around the Pole, in a great swathe cutting through much of Parz's best hinterland. It's all to do with the Star's modes of vibration, I'm told.' He shook his head. 'If it's any consolation there must have been similar bands of destruction encompassing the Star at every latitude, all the way to the North Pole. The Star rang like a Corestuff bell, one cheerful idiot told me . . . Now I have to ensure that the work of relief is coordinated as well as it can be - and to start to consider the consequences of so much damage to Parz's bread-basket hinterland. And I need you with me, Muub; you have thousands of patients throughout the hinterland, not just the few dozen here. And I have another assignment in mind for you . . .'

'As you say.'

Still Hork's eyes probed at the sky. '*Xeelee*,' he said again.

His mind full of images of destruction, Muub tried to focus on what the Chair-elect was saying . . . It seemed very important to Hork. And therefore, he thought wearily, it was important to Muub.

‘I’m sorry, sir. I don’t understand.’

‘That’s what they’re saying.’

Who?’

‘The commoners . . . the ordinary people, here in the ceiling-farm. The coolies and their supervisors. Even some of the medical staff, who should be educated enough to know better.’ Hork’s face grimaced in a ghastly echo of a smile. ‘They all saw the beams in the sky, the ship from beyond the Crust. The reality of these visions seems unquestionable, Muub. And the commoners have only one explanation . . . that the Xeelee have returned to haunt us.’ He looked down of the devastated head of his father. ‘To destroy us, apparently.’

Muub, disturbed, reached out and grasped Hork’s fat-laden shoulder; he felt the tension in Hork’s massive muscles. ‘Sir, this is nonsense. The commoners know nothing. You must not . . .’

‘Rubbish, Muub.’ Again that wild look; but Muub, daring, kept his hand in place. ‘Everyone knows all about the Xeelee, it seems, even after all this time. So much for generations of suppression since the Reformation, eh? These superstitions are like weeds in my father’s fields, I’m starting to think. It’s the same with the damn Wheel cult - no matter how many of the bastards you Break, they keep coming back for more. Quite ineradicable. Even within the Court itself, Muub! Can you believe that?’

Muub felt himself stiffen. ‘Sir, a great disaster has befallen us. We must deal with the consequences of the Glitch. We cannot pay attention to the gossiping of ignorant folk. And . . .’

‘Don’t tell me my duties, Muub,’ Hork said. ‘Of course I have to deal with the impact of this Glitch. But *I cannot ignore what has been seen*, Physician.’ Hork’s round face was stern, determined. ‘A huge ship, penetrating the Crust from the spaces beyond the Star. And appearing to fire some kind of weapon, a spear made of light, into the Quantum Sea. Muub, what if the ship is *causing* the Glitches? What then? Where would my duty lie?’

Muub pulled away from Hork. Despite his exhaustion and shock, he felt a thrill of awe run through him, deep and primitive. *Hork was planning to challenge the Xeelee themselves.*

‘Now that my father’s gone the Court will be a nest of intrigues. In the chaos of this disaster, perhaps there’ll even be an assassination attempt . . .

and I don’t have time to deal with any of it. We have to find a way to combat the threat of the Xeelee. We need knowledge, Muub; we need to understand the enemy before we can fight them.’

Muub frowned. ‘But so many generations after the Reformation our knowledge of the Xeelee mythos has been relegated to fragments of legend. I could consult scholars in the University, perhaps . . .’

Hork shook his heavy head. ‘All the books were fed into Harbour hoppers generations ago . . . And the heads of those “scholars” are as empty as they are shaved of hair.’

Muub forced himself not to run a self-conscious hand over his own bare scalp.

‘Muub, we have to think wider. Beyond the City, even. What about those weird upfluxers you told me about? The old man and his companions . . . curiosities from the wild. The upfluxers are Xeelee cultists, aren’t they? Maybe they could tell us something; maybe they have preserved the knowledge we have foolishly destroyed.’

‘Perhaps,’ Muub said dutifully.

‘Bring them to Parz, Muub.’ Hork glanced down at his father. ‘But first,’ he said quietly, ‘you must attend to your patients.’

‘Yes. I . . . excuse me, sir.’

Gathering his strength, Muub Waved away from the grisly little tableau and returned to his work.

Dura glided to a halt against the soft resistance of the Magfield. She let her limbs rest, loose, against the field; they ached after so many days’ Waving from the ruined ceiling-farm.

She stared around at the empty, yellow-gold sky. The Quantum Sea was a concave bruise far below her, and the new vortex lines arced around her, clean and undisturbed. It was as if the recent Glitch had never happened; the Star, having expelled its excess energy and angular momentum, had restored itself with astonishing speed.

It was a shame, Dura thought, that humans couldn’t do the same.

She sniffed the Air, trying to judge the spacing of the vortex lines, the depth of redness of the distant South Pole. This must be about the right latitude; surely the sky had looked much like this at the site of the Human Beings’ encampment. She dug her hand into the sack tied to the rope at her waist. The sack, massive and awkwardly full of bread when she had started

this trek, was now depressingly easy to carry. She pulled out a small fistful of the sweet, belly-filling bread and began to chew. She could surely be no more than a centimetre or so from the Human Beings' site; she ought to be able to see them by now. Unless they'd moved on, of course - or, she thought, her heart heavy, unless they'd been destroyed by the Glitch. But even so she'd surely find their artifacts, scattered here - or their bodies. And . . .

'Dura! Dura!'

The voice came from somewhere above her, towards the Crust-forest. Dura flipped back in the Air and peered upwards. It was difficult to pick out movement against the misty, complex texture of the forest, but - there! A man, young, slim, naked, Waving alone - no, she saw, something was accompanying him: a slim, small form which buzzed around his legs as he Waved down towards her. She squinted. An Air-piglet? No, she quickly realized; it was a child, a human infant.

She surged through the Air, up towards the forest; she was still aware of the fatigue in her legs, but that felt distant, unimportant now.

The two adults came to a halt in the Air, perhaps a mansheight apart; the infant, no more than a few months old, clung to the man's legs while the adults studied each other with an odd wariness. The man - no more than a boy himself, really - smiled cautiously. There seemed to be no fat in his face at all, and there were streaks of premature yellow in his hair; when he smiled his eyecups seemed huge, his teeth prominent. Under the superficial changes, wrought by hunger and fatigue, this face was as familiar as her own body, a face she had known for half her life. After the thousands of strangers to whom she'd been exposed in Parz, and later at the ceiling-farm, Dura found herself staring at this face as if rediscovering her own identity. It felt as if she'd never been away from the Human Beings, and she wanted to drink in this familiarity.

'Dura? We never thought we'd see you again.'

It was Mur, husband of Dia. And this must be Jai, the boy whom Dura had helped deliver, just after the Glitch which killed her father.

She moved towards Mur and folded him in her arms. The bones in Mur's back were sharp under her fingers, and his skin was filthy, slick with fragments of Crust-tree leaves. The baby at his leg mewled, and she reached down an absent hand to stroke his head.

‘We thought you must be dead. Lost. It’s been so long.’

‘No.’ Dura forced herself to smile. ‘I’ll tell you all about it. Farr and Adda are both well, though far from here.’ She studied Mur more carefully now, trying to sort out the flood of her initial impressions. The signs of hunger, of poor living, were obvious. She ran her hand over the little boy’s scalp. Through the sparsely haired flesh she could feel the bones of the skull, the plates not yet locked together. The child was pawing at her bag now, his tiny fingers poking at the lumps of food contained there. Mur made to pull the infant away, but Dura pulled out a handful of bread, crumbled it, and presented it to the child. Jai grasped the bread fragments with both hands and shoved them into his mouth; his jaw scraped across his open hands, raking in bread, his eyes unseeing as he fed.

‘What’s that?’

‘Bread. Food . . . I’ll explain it all. Mur, what’s happening here?’

‘We are - fewer.’ His gaze shifted from her face, and he glanced down at his feeding son, as if in search of distraction. ‘The last Glitch . . .’

‘The others?’

The child had finished the bread already. He reached up his hands wordlessly to Dura, imploring more; she could see the fragment he’d devoured as a distinct bulge, high in his empty stomach.

Mur pulled the child away from Dura, soothing him. ‘Come on,’ he said. ‘I’ll take you to them.’

The Human Beings had established a crude camp in the fringes of the Crust-forest itself. The Air here was thin, unsatisfying in Dura’s lungs, and the Quantum Sea curved away from her, far below. Ropes had been slung between branches of the trees, and garments, half-finished tools and scraps of food were suspended from the ropes. Dura touched one of the bits of food gingerly. It was Air-pig flesh, so old it was tough and leathery between her fingertips. The tree-branches for some distance around had been stripped of leaves and bark, revealing how the people had been feeding.

There were only twenty Human Beings left - fifteen adults and five children.

They crowded around Dura, reaching to touch and embrace her, some of them weeping. The familiar faces surrounded her, peering through masks of hunger and dirt. Her heart went out to these people - *her* people - and yet she felt detached from them, distant; she let them touch her, and she

embraced in return, but a part of her wanted to recoil from their childlike, helpless pressing. She felt stiff, civilized. The very nakedness of these *upfluxers* was startling. She felt massive, sleek and bulky, too, compared to their starved scrawniness.

Her experiences, her exposure to Parz City, had changed her, she realized; perhaps she would never again be content to settle into the small, hard, limited life of a Human Being.

She gave Mur her bag of bread and told him to distribute it as he saw fit. As he moved among the Human Beings she saw how sharp eyes followed each move; the aura of hunger which hovered over the people, focusing on the bag of bread, was like a living thing.

She found Philas, the widow of Esk. Dura and Philas moved away from the heart of the crude encampment, out of earshot of the rest of the Human Beings. Oddly, Philas seemed more beautiful now; it was as if privation was allowing the bony symmetry, the underlying dignity of her features, to emerge. Dura could see no bitterness, no trace of the rivalry which had once silently divided them.

‘You’ve suffered greatly.’

Philas shrugged. ‘We couldn’t rebuild the Net, after you left. We survived; we hunted again in the forest and trapped some pigs. But then the second Glitch came.’

The survivors had abandoned the open Air in favour of the fringe of the forest. It wasn’t particularly logical, but Dura thought she understood; the need for some form of solid base, to have a feeling of protective walls around them, would dominate logic. She thought of the folk of Parz in their compressed wooden boxes, their thin walls affording illusory protection from the wilds of the Mantle not half a centimetre from where they lay. Perhaps people all shared the same basic instincts, no matter what their origins - and perhaps those instincts had travelled with humanity from whatever distant Star had birthed the Ur-humans.

It was impossible to find Air-pigs now, no matter how widely the Human Beings hunted. The latest Glitch, savage as it was, had scattered the herds of Pigs as well as devastating the works of humanity. The people were trying to survive on leaves, and were even experimenting with meals of spin-spider flesh.

Of course, it was impossible to subsist on leaves. Without decent food, the Human Beings would surely die. (*And so will I, now that my bread is gone*, she thought with a surprising stab of selfishness.)

Dura turned in on herself, trying to understand her own motives for returning to her people. After Rauc's death, and after she'd helped to cope with the worst of the destruction at Qos Frenk's farm, she learned that most of the coolies were to be released from their indentures. Qos, roots of yellow showing in his pink hair, his small hands wringing each other, had explained that he intended to save what he could of this year's harvest, and then start the slow, painful work of rebuilding his holding. It would take many years before the farm was functioning again, and in the meantime it would not generate any income for Frenk; so he couldn't employ them any longer.

The coolies had seemed to understand. Frenk provided rides back to Parz City for those who wanted it; the rest, dully, had dispersed to seek work in the neighbouring ceiling-farms.

Dura slowly realized that she had lost the indenture which should have paid for Adda's Hospital treatment. Overwhelmed and shocked, she resolved to return to her people, the Human Beings. Later, perhaps, when things had settled down, she would return to Parz and address the problems of Farr, of Adda's debts.

Now, studying Philas's dull, silent face, she wondered what she'd been expecting to find, here among the Human Beings. Perhaps a hidden, childlike part of her had hoped to find everything restored to what it had been when she'd been a small girl . . . when Logue was strong, protecting her, and the world was - by comparison - a stable and safe place.

Of course, that was an illusion. There was nowhere for her to hide, no one who could look after her.

She raised her hands to her face. In fact, she thought with a stab of shameful selfishness, by returning here she'd only placed herself in danger of starvation, *and* had taken on responsibility for the Human Beings once more.

If only I'd gone straight back to Parz. I could have found Farr, and found a way to live. Perhaps I could have forgotten that the Human Beings ever lived . . .

She straightened up. Philas was waiting for her, her face grave and beautiful. ‘Philas, we can’t stay here,’ Dura said. ‘We can’t live like this. It’s not viable.’

Philas nodded gravely. ‘But we have no choice.’

Dura sighed. ‘We do. I’ve told you about Parz City . . . Philas, we must go there. It’s an immense distance, and I don’t know how we’ll manage the journey. But there is food there. It’s our only hope.’

‘What will we do, in Parz City? How will we get food?’

Dura felt like laughing. *We’ll beg*, she thought. *We’ll be hungry freaks; if we’re lucky they will feed us rather than Wheel-Break us. And . . .*

‘Dura!’

Mur came crashing through the forest towards them; his eyes were wide with shock.

Dura felt her hands slip to the knife tucked into the rope at her waist. ‘What is it? What’s wrong?’

‘There’s something outside the trees . . . A box of wood. Drawn by Air-pigs! Just as you’ve described it, Philas . . .’

Dura turned, peering out through the thin foliage. There, easily visible beyond the stripped twigs of the forest fringe, was an Air-car, huge and sleek. It was calling, in a thin, amplified voice.

‘ . . . Dura . . . upfluxer Dura . . . If you can hear me, show yourself. Dura . . .’

‘Tell me about the Xeelee,’ said Hork V.

The Palace anteroom was a hollow sphere about five mansheights across, anchored loosely in the Garden. Fine ropes had been threaded across the interior, and light, comfortable net cocoons were suspended here and there. Smaller nets contained drinks and sweetmeats.

Adda, Muub and Hork occupied three of the cocoons. The three of them faced each other close to the centre of the room. Adda felt as if he were trapped in the web of a Crust-spider.

Adda found Hork’s demanding tone, his stare over that bush of ludicrous face-hair, quite offensive. This was the new Chair of the Parz Committee. So what? Such titles didn’t mean a damn thing to Adda, and the day they did would be a sorry one, he reckoned.

Let them wait. Adda allowed his gaze to slide around the opulence of this chamber.

The painted walls were the ultimate folly, of course. They were designed to give an illusion of the open Air. He studied the drawn-in vortex lines, the purple paint that represented the Quantum Sea. How absurd, thought Adda, for these City people to close themselves away from the world in their boxes of wood and Corestuff, and then go to so much trouble to reproduce what could be found outside.

The centrepiece of the anteroom was a tame vortex ring. And, Adda conceded, it was impressive. It was contained in nested globes of clearwood which revolved continually about three independent axes, maintaining the spin of the Air trapped within. Every child knew that if an unstable vortex line threw off a ring, the torus of vorticity would rapidly lose its energy and decay away; but this trapped ring was fed with energy by the artful spinning of the globes, and so remained stable.

Of course, it wasn't as impressive as the million-mansheight-long vortex lines which spanned the Mantle and arced over the Garden, and which were available for viewing without charge or effort . . .

'I'm glad you're finding the room so interesting.' Hork's tone contained patience, but with an undercurrent of threat.

'I wasn't aware you were in a hurry. After all, you've lasted ten generations without talking to the Human Beings; what's the rush now?'

'No games,' Hork growled. 'Come on, upfluxer. You know why I've asked you here. I need your help.'

Muub interposed smoothly, 'You must make allowances for this old rascal, sir. He rejoices in being difficult . . . a privilege of age, perhaps.'

Adda turned to glare at Muub, but the doctor would not meet his eye.

'I ask you again,' Hork said quietly. 'Tell me of the Xeelee.'

'Not until you tell me that my friends will be returned from their exile.'

'From their *indentures*,' Muub said impatiently. 'Damn it, Adda, I've already assured you that they've been sent for.'

Adda watched Hork, his mouth set firm.

Hork nodded, the motion an impatient spasm which caused ripples to flow over the front of his chest. 'Their debts are dissolved. Now give me my answer.'

'I'll tell you all you need to know in five words.'

Hork tilted his head back, his nostrils glowing.

Adda said slowly, 'You - can - not - fight - Xeelee.'

Hork growled.

‘That’s your intention, isn’t it?’ Adda asked evenly. ‘You want to find a way to beat off Xeelee as if they were rampaging Air-boars; you want to find a way to stop them smashing up your beautiful Palace . . .’

‘They are killing the people I am responsible for.’

Adda leaned forward in his sling. ‘City man, they don’t even know we’re here. Nothing you could do would even raise you to their attention.’

Muub was shaking his head. ‘How can you respect such - such primal monsters? Explain that, Adda.’

‘The Xeelee have their own goals,’ said Adda. ‘Goals which we do not share, and cannot even comprehend . . .’

The Xeelee - moving behind mists of legend - were immense. They were to the Ur-humans as Ur-humans were to Human Beings, perhaps. They were like gods - and yet lower than gods.

Perhaps gods could have been tolerated, by the Ur-human soul. Not the Xeelee. The Xeelee had been *rivals.*

Hork twisted in his sling, angry and impatient. ‘So the Ur-humans, unable to endure the aloof grandeur of these Xeelee, challenged them . . .’

‘Yes. There were great wars.’

Billions had died. The destruction of the Xeelee had become a racial goal for the Ur-humans.

‘ . . . But not for everyone,’ Adda said. ‘As the venom of the assaults grew, so did Ur-human understanding of the Xeelee’s great Projects. For instance the Ring was discovered . . .’

‘The Ring?’ Hork growled.

‘Bolder’s Ring,’ Adda said. ‘A huge construct which one day will form a gateway between universes . . .’

‘What is this old fool babbling about, Physician? What are these universes of which he speaks? Are they in other parts of the Star?’

Muub spread his long, fine hands and smiled. ‘I’m as mystified as you are, sir. Perhaps the universes reside in other Stars. If such exist.’

Adda grunted. ‘If I knew all the answers I’d have spent my life doing a lot more than carve spears and hunt pigs,’ he said sourly. ‘Look, Hork, I will tell you what I know; I’m telling you what my father told me. But if you ask stupid questions you are only going to get stupid answers.’

‘Get on with it,’ Muub murmured.

‘Even if they could have been successful,’ Adda said, ‘wise Ur-men came to see that to destroy the Xeelee might be as unwise as for a child to destroy its father. The Xeelee are working on our behalf, waging immense, invisible battles in order to save us from unknown danger. We cannot understand their ways; we are as dust in the Air to them. But they are our best hope.’

Hork glared at him, raking his fat fingers through his beard. ‘What evidence is there for any of this? It’s all legend and hearsay . . .’

‘That’s true,’ Muub said, ‘but we couldn’t expect any more from such a source, sir ...’

Hork shoved himself out of his sling, his bulk quivering in the Air like a sac of liquid. ‘You’re too damn patient, Physician. Legend and hearsay. The ramblings of a senile old fool.’ He Waved to the captive vortex ring and slammed his fist into the elegant spheres encasing it. The outermost sphere splintered in a star around his fist, and the vortex ring broke up into a chain of smaller rings which rapidly diminished in size, swooping around each other. ‘Am I supposed to gamble the future of the City, of my people, on such gibberish? And what about us, upfluxer? Forget these mythical men on other worlds. Why are the Xeelee interested in us? ... and what am I to do about it?’

Past Hork’s wide, angry face, Adda watched the captive vortex ring struggling to reform.

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15

Bzya invited Farr to visit him at his home, deep in the Downside belly of the City.

The Harbour workers were expected to sleep inside the Harbour itself, in the huge, stinking dormitories. The authorities preferred to have their staff where they could call them out quickly in the event of some disaster - and where they had an outside chance of keeping them fit for work. To get access to the rest of the City, outside the Harbour walls, Bzya and Farr needed to arrange not only coincident off-shifts but also coincident out-passes, and they had to wait some weeks before Hosch - grudgingly and reluctantly - allowed the arrangement.

The Harbour, a huge spherical construction embedded in the base of the City, was enclosed by its own Skin and had its own skeleton of Corestuff, strengthened to withstand the forces exerted by the Bell winches. The Harbour was well designed for its function, Farr had come to realize, but the interior was damned claustrophobic, even by Parz standards. So he felt a mild relief as he emerged from the Harbour's huge, daunting gates and entered the maze of Parz streets once more.

The streets - narrow, branching, indecipherably complex - twisted away in all directions. Farr looked around, feeling lost already; he knew he'd have little hope of finding his way through this three-dimensional maze.

Bzya rubbed his hands, grinned, and Waved off down one of the streets. He moved rapidly despite his huge, scarred bulk. Farr studied the street. It looked the same to him as a dozen others. Why that one? How had Bzya recognized it? And...

And Bzya was almost out of sight already, round the street's first bend.

Farr kicked away from the outer Harbour wall and plunged after Bzya.

The area around the Harbour was one of the shabbiest in the City. The streets were cramped, old and twisting. The noise of the dynamo sheds, which were just above this area, was a constant, dull throb. The dwelling-places were dark mouths, most of them with doors or pieces of wall missing; as he hurried after Bzya, Farr was aware of curious, hungry eyecups peering out at him. Here and there people Waved unevenly past - men and women, some of them Harbour workers, and many of them in the strange state called 'drunkenness'. Nobody spoke, to him or anybody else.

Farr shivered, feeling clumsy and conspicuous; this was like being lost in a Crust-forest.

After a short time's brisk Waving, Bzya began to slow. They must be nearly at his home. Farr looked around curiously. They were still in the deepest Downside, almost on top of the Harbour, and the buildings here had the shrunken meanness of the areas closest to the Harbour itself. But in this area there was a difference, Farr saw slowly. The walls and doors were patched, but mostly intact. And there were no 'drunks'. It was astonishing to him how in such a short distance the character of Parz could change so completely.

Bzya grinned and pushed open a doorway - a doorway among thousands in these twisting corridors. Once again Farr wondered how Bzya knew how to find his way around with such unerring accuracy.

He climbed after Bzya through the doorway. The interior of the home was a single room - a rough sphere, dimly illuminated by wood-lamps fixed seemingly at random to the walls. He felt his cup-retinae stretch, adjusting to the low level of light.

A globe-bowl of tiny leaves was thrust into his chest.

He stumbled back in the Air. There was a wide, grinning face apparently suspended over the bowl - startlingly like Bzya's, but half-bald, nose flattened and misshapen, the nostrils dulled. 'You're the upfluxer. Bzya's told me about you. Have a petal.'

Bzya pushed past Farr and into the little home. 'Let the poor lad in first, woman,' he grumbled good-naturedly.

'All right, all right.'

The woman withdrew, clutching her petal-globe and still grinning. Bzya wrapped a huge hand around Farr's forearm and dragged him into the room, away from the door, then closed the door behind them.

The three of them hovered in a rough circle. The woman dropped the petal-globe in the Air and thrust out a hand. 'I'm Jool. Bzya's my husband. You are welcome here.'

Farr took her hand. It was almost the size of Bzya's, and as strong. 'Bzya told me about you, too.'

Bzya kissed Jool. Then, sighing and stretching, he drifted away to the dim rear of the little home, leaving Farr with his wife.

Jool’s body was square, a compact - if misshapen - mass of muscles. She wore what looked like the all-purpose coverall of the Harbour, much patched. One side of her body was quite damaged - her hair was missing down one side of her scalp in wide swathes, and her arm on that side was twisted, atrophied. Her leg was missing, below the knee.

He was staring at the stump of the leg, the tied-off trouser leg below the knee. Suddenly unbearably self-conscious, he lifted his eyes to Jool’s face.

She clapped him on the shoulder. ‘Not much point looking for that leg; you’ll never find it.’ She smiled kindly. ‘Here. Have a petal. I meant it.’

He dug his hand into the globe, pulled out a fistful of the little leaves, and jammed them into his mouth. They were insubstantial, like all leaf-matter, and strongly flavoured - so strong that his head seemed to fill up with their sweet aroma. He coughed, spluttering leaf fragments all over his hostess.

Jool tilted back her head and laughed. ‘Your upfluxer friend hasn’t got very sophisticated tastes, Bzya.’

Bzya had gone to work in one corner of the cramped little room, beneath two crumpled sleeping-cocoons; his arms were immersed in a large globe-barrel full of fragments - chips of some substance - which crunched and ground against each other as he closed his fists around pieces of cloth. ‘Neither have we, Jool, so stop teasing the boy.’

Farr picked up a petal. ‘Is it a leaf?’

‘Yes.’ Jool popped one in her mouth and chewed noisily. ‘Yes, and no. It’s from a flower ... a small, ornamental plant. They’ve been bred, here in Parz. You don’t get them in the wild, do you?’

‘They grow in the Palace, don’t they? In their Garden. Is that where you work?’ He studied her. From the way Cris had described the Committee Palace to him, Jool seemed a little rough to be acceptable there.

‘No, not the Palace. There are other parts of the Skin, a little further Downside, where flowers, and bonsai trees, are cultivated. But not really for show, like in the Garden.’

‘Why, then?’

She crunched on another leaf. ‘For food. And not for humans. For pigs. I wait on Air-pigs, young Farr.’ Her eyes were bright and amused.

Farr was puzzled. ‘But these leaves - petals - can’t be very nutritious.’

‘They don’t make the pigs as strong as they could be, no,’ she said. ‘But they have other advantages.’

‘Oh, stop teasing the lad,’ Bzya called again. ‘You know, she used to work in the Harbour.’

‘We met there. I was his supervisor, before that cretin Hosch was promoted. At the expense of this huge dolt Bzya, I’m afraid. Farr, do you want some beercake?’

‘No. Yes. I mean, no thank you. I don’t think I’d better.’

‘Oh, try a little.’ Jool turned to a cupboard set in the wall and opened its door. The door was ill-fitting, but the food store within was well stocked and clean ‘I’ll bet you’ve never tried it. Well, see what it’s like. What the hell. We won’t let you get drunk, don’t worry.’ She withdrew a slab of thick, sticky-looking cake wrapped in thin cloth; she broke off a handful and passed it to Farr.

Bzya called, ‘Cake is fine as long as you chew it slowly, and know when to stop.’

Farr bit into the cake cautiously. After the pungency of the petals it tasted sour, thick, almost indigestible. He chewed it carefully - the taste didn’t improve - and swallowed.

Nothing happened.

Jool hung in the Air before him, huge arms folded. ‘Just wait,’ she said.

‘Funny thing,’ Bzya called, still working at his globe of crunching chips. ‘Beercake is an invention of the deep Downside. I guess we evolved it to stave off boredom, lack of variety, lack of stimulation. The poor man’s flower garden, eh, Jool?’

‘But now it’s a delicacy,’ Jool said. ‘They take it in the Palace, from globes of clearwood. Can you believe it?’

Warmth exploded in the pit of Farr’s stomach. It spread out like an opening hand, suffusing his torso and racing along his limbs like currents induced by some new Magfield; his fingers and toes tingled, and he felt his pores ache deliciously as they opened.

‘Wow,’ he said.

‘Well put.’ Jool reached out and took the beercake from his numb fingers. ‘I think that’s enough for now.’ She wrapped the cake in a fragment of cloth and stowed it away in its cupboard.

Farr, still tingling, drifted across the room to join Bzya. The big Fisherman's arms were still buried in the barrel of chips, and his broad hands were working at a garment - an outsize tunic - inside the chips, rubbing surfaces together and scraping the cloth through the chips. Bzya hauled the tunic out of the globe and added it to a rough sphere of clothes, wadded together, which orbited close to his wide back. Bzya grinned at Farr, rubbed his hands, and plunged a pair of trousers into the chips. 'Jool has been looking forward to meeting you.'

'What happened to her?'

Bzya shrugged, his arms extended before him. 'A Bell accident, deep in the underMantle. It was so fast, she can't even reconstruct it. Anyway, she left half herself down there. After that, of course, she was unemployable. So the Harbour said.' He smiled with unreasonable tolerance, Farr thought. 'But she still had her indenture to fulfil. So she came out of the Harbour with one leg, a dodgy husband, and a debt.'

'But she works now.'

'Yes.'

He fell into silence, and Farr watched him work the clothes curiously.

Bzya became aware of his stare. 'What's the matter? ... Oh. You don't know what I'm doing, do you?'

Farr hesitated. 'To be honest, Bzya, I get tired of asking what's going on all the time.'

'Well, I can sympathize with that.' Bzya carried on rubbing the grit through his clothes, impassive.

After a few heartbeats of silence Farr gave in. 'Oh, all right. What are you doing, Bzya?'

'Washing,' Bzya said. 'Keeping my clothes clean. I don't suppose you do much of that, in the upflux ...'

Farr was irritated. 'We keep ourselves clean, even in the upflux. We're not animals, you know. We have scrapers ...'

Bzya patted the side of his barrel of chips. 'This is a better idea. You work your clothes through this mass of chips - bone fragments, bits of wood, and so on. You work the stuff with your hands, you see - like this - get it into the cloth ... The chips are crushed, smaller and smaller, and work into the cloth, pushing out the dirt. Much less crude than a scraper.' He hauled a shirt out of the barrel and showed it to Farr. 'It's time-consuming,

though. And a bit boring.’ He eyed Farr speculatively. ‘Look, Farr, while you’re in the City you ought to sample the richness of its life to the full. Why don’t you have a go?’

He moved eagerly away from the barrel, rubbing a layer of bone-dust from his arms.

Farr, well aware he was being teased again, took another shirt - this one stiff with grime - and shoved it into the barrel. As he’d seen Bzya do, he kneaded the cloth between his fingers. The chips crackled against each other and squirmed around his fingers like live things. When he drew the shirt out again the dust coated his hands, so that his fingers felt strange against each other, as if gloved. But the shirt hardly seemed any cleaner.

‘It does need practice,’ Bzya said dryly.

Farr plunged the garment back into the barrel and pressed harder.

Jool had been fixing food; now she slapped Bzya on the shoulder. ‘Every time someone comes to see us he gets them washing his smalls,’ she said.

Bzya tilted back his battered face and bellowed laughter.

Jool led Farr to the centre of the little room. A five-spoked Wheel of wood hovered here, with covered bowls jammed into the crevices between its spokes. Hanging in the Air the three of them gathered close around the Wheel-table, enclosing it in a rough sphere of faces and limbs, the light of the wood-lamps playing on their skin. Now Jool lifted the covers from the bowls and let them drift off into the Air. ‘Belly of Air-piglet, spiced with petals. Almost as good as Bzya can make it. Eggs of Crust-ray . . . ever tried this, Farr? Stuffed leaves. More beercake ...’

Farr, with Bzya prompting, dug his hands into the bowls and crammed the spicy, flavoursome food into his mouth. As they ate, the conversation dried up, with both Bzya and Jool too intent on feeding. He couldn’t help comparing the little home with the Mixxaxes’, in the upper Midside. There was only one room, in contrast to the Mixxaxes’ five. A waste chute - scrupulously clean - pierced another wall of the room they ate in. And Jool and Bzya were far less tidy than the Mixxaxes. The clump of cleaned clothes had been simply abandoned by Bzya, and now it drifted in the Air, sleeves slowly uncoiling like limp spin-spider legs. But the place was clean. And he spotted a bundle of scrolls, loosely tied together and jammed into one corner. The Wheel symbol was everywhere - carved into the walls, the

shape of the table from which they ate, sculpted into the back of the door. There was a much greater feeling of age, of poor construction and shabbiness, than in the Midside ... But there was more *character* here, he decided slowly.

He looked at the wide, battered, intelligent faces of Bzya and Jool as they worked at their food. The light of the lamps seemed to diffuse around them, so that their faces were evenly illuminated (the apparently random placing of the lamps was actually anything but, he realized). There was a quiet, unpretentious intelligence here, he thought.

He briefly imagined living with these people. What if he'd grown up *here*, deep inside Parz, in this strange, old, cramped part of the City?

It wouldn't have been so bad, he decided. His mood swung into a feeling of pigletish devotion to these two decent people.

Surreptitiously he shook his head, wondering if the beercake was affecting his judgement.

He became aware of Jool and Bzya watching his face curiously.

He blurted, 'Do you have children?'

Jool smiled over a fistful of food. 'Yes. One, a girl. Shar. We don't see much of her. She works out of the City.'

'Don't you miss her?'

'Of course,' Bzya said simply. 'Which is why I haven't mentioned her before, Farr. What can't be helped shouldn't be brooded on.'

'Why not bring her back?'

'It would be up to her,' Bzya said gently. 'I doubt if she'd want to come. But she's too far away. She's a ceiling-farm coolie. Like your sister, from what you say.'

Farr felt vaguely excited. 'I wonder if they'll meet.'

Jool laughed. 'The hinterland may seem a small place to an upfluxer, Farr, but it contains hundreds of ceiling-farms. Shar's serving out her indenture. It's hard for her to get home until that's through. Then, maybe, she'll get a more senior job on the farm. She's working for a decent owner. Equitable.'

'I don't understand.'

Jool frowned. 'What? How we can live apart, like this?' She shrugged. 'I'd rather have her away from us and safe, than here but in the Harbour. It's just the way things are for us ...'

‘Farr has family,’ Bzya said.

Jool nodded. ‘A sister. The coolie. Yes? And there’s another with you from the upflux, an old man ...’

‘Adda.’

‘And you’re separated from them both. Just like us, with Shar.’

Farr nodded. ‘But Dura’s being brought back from her ceiling-farm. Deni Maxx has gone to get her.’

‘Who?’

‘A doctor. From the Hospital of the Common Good ... And Adda has been taken to see the Chair of the City. It’s all to do with sorting out the Glitches ...’

‘Hm,’ Bzya said. ‘Perhaps. Farr, I don’t believe everything I hear from the Upside, and I’d suggest you grow a little scepticism too. Still, I hope you see your sister soon.’

Jool was working towards the bottom of the bowl of piglet meat. ‘So what do you make of our part of the City?’

Farr finished his mouthful. ‘It’s different. It’s ...’ He hesitated.

‘Dark, dirty, threatening. Right?’

Farr shook his head. ‘I was going to say cramped. Even more cramped than everywhere else.’

‘Well, this is the heart of the City,’ Jool said. ‘I’m not sentimental about it, but that’s the truth ... It’s the oldest part of Parz. The first to be built, around the head of the Harbour, when the Spine was first driven into the underMantle.’

Farr imagined those ancient days, the bravery of the men and women determined to extract the Corestuff they needed to build their City, and then constructing that immense structure with their bare hands and tools little more advanced, he guessed, than the average Human Being’s today.

Jool smiled. ‘I know what you’re thinking, boy from the upflux. Why would anyone build a little box like this around themselves? Why shut out the Air?’

‘Because,’ Bzya said; ‘they were trying to rebuild what they thought they’d lost, when the Colonists withdrew into the Core.’ He looked thoughtful. ‘So Parz is a representation in wood and Corestuff of an ancient dream ...’

‘You’re both very intelligent,’ Farr found himself saying.

Husband and wife together tilted back their heads and opened their throats with laughter. The pair of them made a ludicrous, outsized, merry sight in the room's cramped Air.

Jool wiped her eyecups. 'You say what you think, don't you?'

Bzya patted her arm. 'We aren't fair to laugh, Jool. After all, we know plenty of people - even in the lower Midside, let alone the Upside - who think Downsiders are all subhuman.'

'And,' Farr said, 'with Human Beings - upfluxers - worse than that.'

'But it's rubbish,' Bzya said fervently. He grabbed a ray egg from the bowl and waggled it before Farr's face. 'Humans are more or less equal, as far as I can see, no matter where they come from. And I'll go further.' He bit into the soft egg and spoke around his chewing. 'I believe humans throughout this Star are intelligent - I mean, more so than the stock on other human worlds; perhaps more intelligent even than the average Ur-human.'

Jool shook her head. 'Listen to him, the ruler of a hundred Stars.'

'But there's logic to what I say. Think about it,' Bzya went on. 'We're descended from a selected stock - of engineers, placed in the Star to modify it; to build a civilization in the Mantle. The Ur-humans wouldn't include fools in that stock, any more than they would have made us too weak, or too ill-adapted.'

'The analogous anatomists have worked out much of what we know about the Ur-humans' project from our ill-adaptation,' Jool said, her wide face lively and interested. 'From our inappropriate form, based on the Ur-human prototype. And ...'

Their conversation, illuminating and informed, washed around Farr; he listened, mellow and relaxed, chewing surreptitiously on a little more beercake.

Jool turned to Farr. 'Of course, we weren't so clever as to avoid setting up a rigid, stratified society to control each other with.'

'Here in Parz, anyway,' Farr said.

'Here in Parz,' she conceded. 'You Human Beings are evidently much too smart to put up with it all.'

'We were,' Farr said mildly. 'That's why we left.'

'And now you've come back,' Bzya said. 'To the lowest strata, at the bottom of the City ... Upside, Downside, bottom, top; all those up-and-down concepts are relics of Ur-human thinking - did you know that? ... here

in the Downside we're regarded as less intelligent, less aware, than the rest. In the past people here have reacted to that.' His large, battered, thoughtful face looked sad. 'Badly. If you treat people as less than human, often they behave like it. A couple of generations ago this part of the Downside was a slum. A jungle.'

'Parts of it still are,' Jool said.

'But we've pulled ourselves out of it.' Bzya smiled. 'Self-help. Education. Oral histories, numeracy, literacy where we've the materials.' He bit into a slice of beercake. 'The Committee does damn all for this part of the City. The Harbour does less, even though most of us are Harbour employees. But we *can* help ourselves.'

Farr listened to all this with a certain wonder. These people were like exiles in their own City, he thought. Like Human Beings, lost in this forest of wood and Corestuff. He told them of lessons and learning among the Human Beings - histories of the tribe and of the greater mankind beyond the Star, told by elders to little huddles of children suspended between the vortex lines. Bzya and Jool listened thoughtfully.

When the food was finished, they rested for a while. Then Bzya and Jool moved a little closer to each other, apparently unconsciously. Their huge heads dipped, so that their brows were almost touching. They reached forward and placed wide, strong fingers on the rim of the Wheel. Quietly they began to speak - in unison, a slow, solemn litany of names, none of them familiar to Farr. He watched them in silence.

When they finished, after perhaps a hundred names, Bzya opened his eyecups wide and smiled at Farr. 'A little oral history in action, my friend.'

Jool's face had resumed the sly, playful expression of earlier. She reached across the Wheel-table and touched Farr's sleeve. 'Have you figured out what my job is yet?'

'Oh, stop teasing the boy,' Bzya said loudly. 'I'll tell you. She gathers petals from the Upside gardens, and delivers them to the pig-farms - the small in-City ones scattered around Parz, where the pigs for the Air-cars that run within the City are kept.'

'Think about it,' Jool said. 'The streets of the City are hot and cramped. Enclosed. All those Cars. All those pigs ...'

'The petals are ground up and added to the pigs' feed,' Bzya said.

Farr frowned. 'Why?'

‘To make them easier to live with.’ Solemnly, Jool bent forward, tilted her stump of leg, grabbed her wide buttocks through her coverall and separated them, and farted explosively.

Bzya laughed.

Farr looked from one to the other, uncertainly.

Then the smell hit him. Her fart was petal-perfumed.

Bzya shook his head, sighing. ‘Oh, don’t pay her any attention; it will only encourage her. More beercake?’

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16

The driver of the car from Parz City was Deni Maxx, the junior doctor who had treated Adda. Dura wanted to rush to her, to demand news of Farr and Adda.

The Human Beings - all twenty of them, including the five children - emerged from their shelter in the forest and trailed after Dura. Deni Maxx peered out of the open hatch at her, staring indifferently past her at the ring of skinny Human Beings. ‘I’m glad I’ve found you.’

‘I’m surprised you managed it. The upflux is a big place.’

Deni shrugged. She seemed irritated, impatient. ‘It wasn’t so hard. Toba Mixxax gave me precise directions from his ceiling-farm to the place he first found you. All I had to do was scout around until you responded to my call.’

Philas crowded close to Dura. The widow pressed her mouth close to Dura’s ear; Dura was aware, uncomfortably, of the sweet, thin stink of leaves and bark on Philas’s breath. ‘Who is she? What does she want?’

Dura pulled her head away. She was aware of Deni’s appraising gaze. She felt a swirl of contradictory emotions: irritation at Deni’s high-handed manner, and yet a certain embarrassment at the awkward, childlike behaviour of the Human Beings. Had she been such a primitive on her first encounter with Toba Mixxax?

‘Get in the car,’ Deni said. ‘We’ve a long journey back to Parz, and I was told to hurry ...’

‘Who by? Why am I being recalled? Is it something to do with my indenture? Surely you saw Qos Frenk’s ceiling-farm - or what was left of it; it’s no longer functioning. Qos released us, and ...’

‘It’s nothing to do with your indenture. I’ll explain on the way.’ Deni drummed her fingers on the frame of the car’s door.

Dura was aware of the staring eyes of the rest of the tribe, as they waited mutely for her to make a decision. She felt a brief, selfish stab of impatience with them; they were dependent, like children. *She wanted to go back to Parz.* She could surely - she told herself - find out more about the situation of Farr and Adda there than if she stayed with the Human Beings as just another simple refugee upfluxer. And, in the long run - she justified to herself - she could maybe do more to help all the Human Beings by

returning than by staying here. Something important must be required of her, for the City to send someone like Deni Maxx to fetch her. Perhaps in some odd way she would have *influence* over events ...

Philas tugged at her arm, like a child, demanding attention. Dura pulled her arm away angrily - and instantly regretted the impulse.

The truth was, she admitted to herself, she was relieved that she had an excuse, and the means, to get away from the suffocating company of the Human Beings. But she felt such *guilt* about it.

She came to a quick decision. ‘I’ll come with you,’ she told Deni. ‘But not alone.’

Deni frowned. ‘What?’

‘I’ll take the children.’ She widened her arms to indicate the five children - the youngest was Mur’s infant, Jai, the oldest an adolescent girl.

Deni Maxx launched into a volley of complaints.

Dura turned her back and confronted the Human Beings. They pulled their children to themselves in baffled silence, their eyes huge and fixed on her. She ran a hand through her hair, exasperated. Slowly, patiently, she described what awaited the children at Parz City. Food. Shelter. Safety. Surely she could prevail on Toba Mixxax to find temporary homes for the children. They were all young enough to seem cute to the City folk, she calculated, surprising herself with her own cynicism. And in a few short years they’d be able to turn their upfluxer muscles to gainful employment.

She was consigning the children to lives in the Downside, she realized. But it was better than starving here, or sharing their parents’ epic trek across the devastated hinterland of Parz. And eventually, she insisted to the bewildered parents, they would reach Parz themselves and be reunited with their offspring.

The adults were baffled and frightened, struggling to deal with concepts they could barely envisage. But they trusted her, Dura realized slowly, with a mixture of relief and shame - and so, one by one, the children were delivered to Dura.

Deni Maxx glared as the grimy bodies of the children were passed into her car, and Dura wondered if Deni was even now going to raise some cruel objection. But when the doctor watched Dura settle little Jai - frightened and crying for his mother - in the arms of the oldest girl at the back of the car, Deni’s irritation visibly softened.

At last it was done. Dura gathered the bereft adults in a huddle and gave them strict instructions on how to get to the Pole. They listened to her solemnly. Then Dura embraced them all, and climbed into the car.

As Deni flicked the team of Air-pigs into motion, Dura stared back through the huge, expansive windows at the Human Beings. Shorn of their children, they looked lost, bewildered, futile. Dia and Mur clung to each other. *I've taken away their future*, Dura realized. *Their reason for living.*

Or, perhaps, I've preserved their future.

When the Human Beings were out of sight - and despite the continuing crying of the frightened, disoriented children - Dura settled into one of the car's expensive cocoons, relief and guilt once more competing for her soul.

Deni steered the car with unconscious skill along the renewed vortex lines. 'The City is taking in injured from the hinterland. It's not been easy, for any of us.' The doctor was scarcely recognizable from the cheerful, rather patronizing woman who had treated Adda, Dura thought; Maxx's eyecups were ringed by darkness and crusty sleep deposits; her face seemed to have sunk in on itself, becoming gaunt and severe, and she hunched over her reins with tense, knotted muscles.

Dura stared moodily out of the car's huge windows at the Crust as it passed over them. She remembered how she had marvelled at the orderliness of the great hinterland with its ceiling-farms and gardens, as she had viewed it that first time with Toba Mixxax. Now, by contrast, she was appalled at the destruction the Glitch had wrought. In great swathes the farms had been scoured from the Crust, leaving the bare root-ceiling exposed. Here and there coolies still toiled patiently at the shattered land, but the naked ceiling had none of the vigour of the natural forest; obscenely stripped of its rectangles of cultivation it looked like an open wound.

Deni tried to explain how the Crust had responded to the Glitch by *ringing* - vibrating in sectors, apparently all over the Star; the devastation had come in orderly waves, with a lethal and offensive neatness. Dura let the words wash over her, barely understanding.

'The destruction persists right around the hinterland,' Deni said. 'At least half the ceiling-farms have stopped functioning, and the rest can only work on a limited basis.' She glanced at Dura. 'Parz City doesn't have much stock of food, you know; she relies on the daily traffic from the ceiling-farms. And you know what they say ...'

‘What?’

‘Any society is only a meal away from revolution. Hork has already instituted rationing. In the long term, I doubt it’s going to be enough. Still, at the moment people seem to be accepting the troubles we’re having: patiently waiting their turn for medical treatment behind ranks of coolies, following the orders of the Committee. Eventually, I guess, they will blame the Committee for their woes.’

Dura took a deep breath. ‘Just as you’re blaming me?’

Deni turned to her, her eyes wide. ‘Why do you say that?’

‘Your tone. Your manner with me, ever since you arrived to bring me back.’

Deni rubbed her nose, and when she looked at Dura again there was a faint smile on her lips. ‘No. I don’t blame you, my dear. But I do resent being a ferry driver. I have patients to treat ... At a time like this I have better things to do than ...’

‘Then why did you come to get me?’

‘Because Muub ordered me to.’

‘Muub? Oh, the Administrator.’

‘He felt I was the only person who would recognize you.’ She sniffed. ‘Old fool. There aren’t that many upfluxers on Qos Frenk’s ceiling-farm, after all.’

‘I still don’t understand why you’re here.’

‘Because that friend of yours insisted on it.’ She frowned. ‘Adda? Worst patient in the world. But what beautiful work we did with his pneumatic vessels.’

The Air seemed thick in Dura’s mouth. ‘Adda is alive? He’s safe?’

‘Oh, yes. He was with Muub when the Glitch hit. He’s quite well ... or at least, as well as before. You know, with injuries like that it’s a miracle he’s able to move about. And ...’

Dura closed her eyes. She hadn’t dared ask of her kinsmen earlier - as if phrasing the very question would tempt fate. ‘And Farr?’

‘Who? Oh, the boy. Your brother, isn’t he? Yes, he’s fine. He was in the Harbour ...’

‘You’ve seen him? You’ve *seen* that he’s safe?’

‘Yes.’ Some compassion entered Deni’s voice. ‘Dura, don’t worry about your people. Adda had Farr brought to the Palace ...’

‘The *Palace*?’

‘Yes, it was a condition of him working with Hork, apparently.’

Dura laughed; it was as if a huge pressure had been lifted from her heart. But still, what was Adda doing handing out orders at the Palace? Why were they so important, all of a sudden? ‘Things have changed since I’ve been gone.’

Deni nodded. ‘Yes, but don’t ask me about it ... Muub will tell you, when we dock.’ She growled, ‘another Physician taken away from healing people ... I hope this project of Hork’s, whatever it is, really is important enough to cost so many lives.’

They were approaching the South Pole now; the vortex lines, deceptively orderly, were beginning to converge. Dura studied the Crust. The elegant, pretty farms and gardens of the ceiling-scape here had largely been spared the Glitch’s devastation, but there was something odd: the Crust had a fine texture, as if it were covered by fine, dark furs - furs which Waved in slow formation towards the Pole.

Dura pointed this out to Deni. ‘What’s that?’

Deni glanced up. ‘Refugees, my dear. From all over the devastated hinterland. No longer able to work on their farms, they are converging on Parz City, hoping for salvation.’

Dura stared around the sky. *Refugees*. The Crust seemed black with humanity.

The children started to cry again. Dura turned to comfort them.

When Hork heard that the two upfluxers - the boy from the Harbour and the woman, Dura - had been located and were being returned to the Upside, he called Muub and the old fool Adda to another meeting in the Palace anteroom.

Adda settled into his cocoon of rope, his splinted legs dangling absurdly, and he swept his revolting one-eyed gaze around the anteroom as if he owned the place.

Hork suppressed his irritation. ‘Your people are safe. They are inside the City. Now I would like to continue with our discussion.

Adda stared, eyeing him up as if he were a coolie in the Market. At last the old man nodded. ‘Very well. Let’s proceed.’

Hork saw Muub sigh, evidently with relief.

‘I return to my final question,’ Hork said. ‘I concede the existence of the Xeelee. But I am not concerned with myths. I don’t want to hear about the awesome racial goals of the Xeelee ... I want to know what they want with *us*.’

‘I told you,’ Adda said evenly. ‘They don’t want anything of us. I don’t think they even know we’re here. But they do want something of our world - our Star.’

‘Apparently they wish to destroy it,’ Muub said, running a hand over his bare scalp.

‘Evidently,’ Adda said. ‘Hork, the wisdom of my people - handed down verbally since our expulsion from ...’

‘Yes, yes.’

‘ ... has nothing to say about any purpose of the Star. But we do know that humans were brought here, to this Star. By the Ur-humans. And we were adapted to survive here.’

Muub was nodding at this. ‘This isn’t a surprise, sir. Analogous anatomy studies have come to similar conclusions.’

‘I am struggling to contain my fascination,’ Hork said acidly. Restless, frustrated, he pushed his way out of his sling and began to swim briskly around the room. He watched the turning of the small, powerful cooling-fan set in one corner of the painted sky; he studied the captive vortex ring in its nest of clearwood spheres. He resisted the temptation to smash the spheres again, despite his mounting frustration; the cost of repair had been ruinous - indefensible, actually, in such times as now. ‘Go on with your account. If humans were brought here, made to fit the Mantle - then why isn’t the evidence of this all around us? Where are the devices which made us? Where are these “different” Ur-humans?’

Adda shook his head. ‘At one time there *was* plenty of evidence. Marvellous devices, left here by the Ur-men to help us survive, and to work here. Wormhole Interfaces. Weapons, huge structures which would dwarf your shabby City ...’

‘Where are they now?’ Hork snapped. ‘And don’t tell me they were suppressed, deliberately destroyed by some vindictive Parz administration of the past.’

‘No.’ Adda smiled. ‘Your forebears did not have to conceal physical evidence ... merely the truth.’

‘Get on with it.’

‘The Colonists,’ Adda said slowly.

‘What?’

Once, humans had travelled throughout the Star. The Quantum Sea had been as clear as the Air to them, in their marvellous machines. They had been able to venture even into the outer layers of the Core with impunity. And there had been marvellous gateways, called wormhole Interfaces, which had allowed humans even to travel *outside the Star itself.*

The humans, following the commands of their departed creators, the Ur-humans, had set about rebuilding the Star. And the mysterious Colonists, sleeping in their quark soup at the Core, had become hostile to the growing power of humans.

The Colonists had emerged from the Core. Brief, shattering wars were fought.

Human machines were destroyed or dragged into the Quantum Sea. The human population was devastated, the survivors pitched into the open Air virtually without resource.

Within generations, the stories of man’s origin on the Star, the tale of the Colonists, became a dim legend, another baroque detail in the rich word-painting of human history, of the invisible worlds beyond the Star.

Muub laughed out loud, his long, aristocratic face creased with mirth. ‘I’m sorry, sir,’ he said to Hork. ‘But here we are compounding myth on myth. How long are we to continue with this charade? I have patients to attend.’

‘Shut up, Muub. You’ll stay here as long as I need you.’

Hork thought hard. He had damnably little resource to spare. He had to tend the wounded and destitute, and, in the longer term, rebuild on the hinterland, alleviate the hunger of the people.

And yet, and yet ...

If - by a small diversion of effort - he could remove the fantastic Xeelee threat from the City - the whole world, in fact - then he could become the greatest hero of history.

There was pride, self-aggrandizement in such a vision, Hork knew. So what? If he could repel the Xeelee, mankind would rightfully acclaim him.

But how to go about it?

He certainly couldn't devote armies of scholars to piecing together the fragmentary legends of man's origin. And he didn't have the years to wait while some such discipline as Muub's 'analogous anatomy' cogitated over its subject matter. He had to prioritize, to go for the most direct benefit.

He looked at Adda sharply. 'You say these beings - the Colonists - took the Interfaces, and the other magical machines, back into the Quantum Sea with them. Beyond the reach of our Fishermen. So we've no reason to believe the devices were destroyed?'

Adda looked up; the leech nibbling at his eye, disturbed, slid across his cheek. 'Nor any evidence that they survived.'

Muub snorted. 'Now the old fool has the effrontery to talk of evidence!'

What if this legend of Colonists and ancient technologies held some grain of truth? Then perhaps, Hork speculated, some of these devices *could still exist,* deep in the Quantum Sea. An Interface would be worth having ...

'Muub,' he asked thoughtfully. 'How could we penetrate the Quantum Sea?'

Muub looked at him, as if shocked by the suggestion. 'We cannot, of course, sir. It is impossible.' His eyes narrowed. 'You are not thinking of chasing after these absurd legends, of wasting resources on a ...'

'You will not lecture me, Physician,' Hork snapped. 'Think of it as a - a scientific experiment. If nothing else we would learn much about the Star, and about our own capabilities ... and, perhaps, disprove once and for all these fanciful legends of Colonists and antique wonders.' *Or*, he allowed himself to imagine, *perhaps I will uncover a treasure lost to mankind for generations.*

'Sir, I must protest. People continue to die, all over the hinterland. Parz itself may be overwhelmed by the flood of refugees approaching. We must abandon these fantasies of the impossible, and return our attention to the immediate, the practical.'

Hork studied the Physician - Muub was stiff, trembling in his cocoon of rope. His irritation with Muub's stiff anger was eclipsed, suddenly, by respect for this decent man. It must have taken a lot of courage for the Physician to speak out like that. 'Muub - my dear Muub - as soon as I close this meeting I will be immersed in the immediate, the practical ... in the pain of ten thousand human beings.' He smiled. 'I want you to take charge of this project. Reach the Quantum Sea.'

Muub ground out, ‘The task - is - impossible.’

Hork nodded. ‘Of course. Bring me options, within two days.’

He turned from them then, and, straightening his back, thrust through the Air to the door and his duties.

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17

After she'd endured a brief, unsettled sleep in Deni's cramped quarters, a messenger from the Committee called for Dura. The messenger was a small, rather sad man in a scuffed tunic; his skin was thin and pale and his eyes were bruised-looking, discoloured deep inside the cups. Perhaps he had spent too much of his life doing close work inside the City, Dura thought, shut away from fresh Air.

She was led away from the Hospital and through the streets. They passed through the Market, and Waved Upside along Pall Mall. The great avenue seemed quieter than she remembered. The lines of Air-cars moved much more easily than before, with clear Air between the sparsely spaced cars, and many of the shops were closed up, their wood-lamps dimmed. She began to understand how the disaster in the hinterland had impacted the economy of the City.

Even so, the noise was a constant, growling racket and the few fans and illumination vents seemed hardly sufficient. Soon Dura found herself fighting off claustrophobia. And yet, only days before, she had been feeling restless in the limited company of the upfluxers. Her experiences really had left her a misfit, she thought gloomily.

They took a turn off the Mall close to its Upside terminus and emerged, surprisingly, into clear Air-light. They had entered a huge open chamber, a cube a hundred mansheights on a side. Its edges were constructed of fine beams, leaving the faces open to the clear sky - this place must be clinging to the side of the City like some immense wooden leech - but, oddly, the Air was no fresher here than in the bowels of the City, and there was no discernible breeze. Looking more closely, she realized that the apparently open faces of this cube were coated with huge panels of clearwood; she was inside a transparent wooden box big enough to hold - she estimated quickly - a thousand people.

It was impressive, but utterly bizarre; Dura felt bemused - as so often before - by the strangeness of the City.

The messenger touched her elbow. 'Here we are. This is the Stadium. Of course it's empty today; when it's in use it's crammed with people ... Up there you can see the Committee Box.' He pointed to a thin balcony suspended over the Stadium itself; his voice was thin, ingratiating. 'People

come here to watch the Games - our sporting events. Do you have Games in the upflux?'

'Why have I been brought here?'

The little man shied away, his bruised-looking eyecups closing.

'Dura ...'

Farr ?

She whirled in the Air. Her brother was only a mansheight from her; he was calm and apparently well, and dressed in a loose tunic. There were people with him - Adda and three City men.

She saw all this in the heartbeat it took to cross the space between them and take her brother in her arms. He hugged her back - but not as an uninhibited child, she slowly realized; he put his arms around her and patted her spine, comforting her.

She let him go and held him at arm's length. His face was square and serious. He seemed to have grown older, and there was more of their father about him.

'I'm well, Dura.'

'Yes. So am I. I thought you might have been injured in the Glitch.'

'I wasn't in the Bells when the Glitch came. It was my off-shift, and I was in the Harbour ...'

'That doesn't matter,' she said bitterly. 'You're too young to have been sent down in those things.'

'It's just the way things are,' he said gently. 'Boys younger than me have served in the Bells. Dura, none of it is your fault ... even if I'd been hurt it wouldn't have been your fault.'

He *was* comforting her. He really was growing up.

'Anyway, I haven't been back to the Harbour for a while,' Farr went on. He smiled. 'Not since Adda had Hork send for me. I've been staying with Toba.'

'How are the family?'

'Well. Cris has been teaching me to Surf.' Farr held his arms out in the Air, as if balancing on an invisible board. 'You'll have to try it ...'

'Dura. You've made it; I'm glad.' Adda came paddling through the Air towards them. Dura glanced quickly over the old man; his shoulders, chest and lower legs were still bound up with grubby bandages, but he was moving freely enough. He was towing an object which looked like the skin

of an Air-pig; sewn up and inflated, it bobbled behind his clumsy progress like a toy.

She found a clear place on his face - away from the eye-leech - and kissed him. ‘I’d hug you if I wasn’t scared of breaking you.’

He snorted. ‘So you got through the Glitch.’

Briefly she told her story; Farr’s eyes grew round when she described the Xeelee ship. She told them how the Human Beings had fared in the Glitch - of their twenty dead. As she recited the familiar, lost names, she was reminded of the simple, moving name-litany ceremony of the lumberjacks.

She told Adda and Farr of the five upfluxer children lodging, for today, with Deni Maxx. Farr and Adda smiled, and promised to visit the kids.

‘Now tell me what we’re doing here. And why you’re towing a dead pig about the place.’

Adda grimaced, making the leech slither across his crumpling cheek. ‘You’ll find out ... damn foolishness, all of it.’ He glanced around to the rest of the party; Dura recognized Muub, the Hospital Physician, with two other men. ‘Come on,’ Adda said. ‘We’d better get on with it.’

With Dura and Farr helping Adda, the three Human Beings made their way to Muub and his companions.

The six of them hovered together close to the centre of the huge emptiness of the Stadium; Dura felt cold and isolated despite the clamminess of the Pole. Ropes and guide rails were slung across the huge volume all around them, silent evidence of the crowds this place was designed to accommodate.

The Physician, Muub, was dressed in a severe, dark robe. As before, Dura found it impossible not to stare at the grand dome of his bald head. He greeted them with a smile which seemed professional enough but a little strained. ‘Thank you for your time.’

Adda grinned. ‘Oh, we had a choice?’

Muub’s smile thinned. Briskly he introduced his two companions: a Harbour supervisor called Hosch, cadaverously thin, who seemed to know Farr, judging from the sour glances he cast at the boy; and a tall, wispy tree-stem of a man called Seciv Trop whom Muub described as an expert on the Magfield. Like Muub’s, Trop’s fine old head was shaven, in the style of the academics of the University.

Muub rapidly sketched in the background to Hork's directive. 'Frankly, I'm not certain about the value of this programme; I may as well tell you that from the start. But I do sympathize with Hork's thinking.' He looked about him, his expression hard. 'I only need to be here, in the fragility of this Stadium, to recognize that we have to find some way to protect ourselves from the random danger of Glitches.'

Dura frowned. 'But why are we here? We Human Beings, I mean. You need experts. What can we possibly add?'

'Two things. One is that you *are* experts - or the nearest we have - on the Xeelee. So Hork believes, at any rate. And second, there's no one else.' He raised his arms as if to embrace the City. 'Dura, Parz may seem a large and rich place to you, but the economy has taken a severe battering from the Glitches. All our resources are devoted to coping with the consequences, to rebuilding the hinterland ... all but us, and we are all Hork felt able to spare.' He smiled at them. 'Six of us, including a boy. And our mission is to save the world. Perhaps we will succeed; and what plaudits we will earn if we do.'

He fell silent. The six of them hovered in a rough ring, studying each other warily - all but the Magfield expert Seciv Trop, who stared into the distance with his finely chiselled eyecups.

'Well,' Muub said briskly. 'Hork asked me to come up with options to achieve the impossible - to penetrate the underMantle, more deeply than any human since prehistory. And I, in turn, asked Hosch and Adda to bring us suggestions to work with. The Bells from the Harbour descend to a depth of about a metre. Our first estimates indicate that we must penetrate at least ten times as deeply - to a depth of ten metres below Parz, deep into the underMantle. Seciv, you're here to comment, if you will, and to add anything you can.'

Trop nodded briskly. 'I'll do my feeble best,' he said in a thin, mannered voice. Seciv Trop was clearly the oldest of the group. His almost-bare scalp was populated by fine clumps of yellow-gold hair, left carelessly unshaven. And his suit - loosely fitting and equipped with immense pockets - was more battered and patched than Dura had come to expect of the grander City folk.

This old fellow was rather endearing, Dura decided. Farr asked, 'Why are we here? In this Stadium?'

‘Because of your friend.’ Muub eyed the pigskin doubtfully. ‘Adda tells me he would prefer to demonstrate his idea rather than describe it. I thought I’d better obtain as much space as possible.’

The Harbour supervisor, Hosch, twisted his face into a sneer. ‘Then maybe we’d better let the old fool get on with it before his damn pig corpse starts stinking out the building.’

Adda grinned and hauled on the short rope which attached the inflated pigskin to his belt. He held the grisly artifact before him, obviously relishing the squeamish reaction of the City men. The skin *was* revolting, Dura conceded; its orifices had been crudely sewn over and Air pumped in to inflate its boxy bulk, causing its six fins to become erect. Its sketchy, inhuman face seemed to be staring at her. And, she realized, it actually did stink a little.

Hosch sneered. ‘Is this some kind of joke? The old fool thinks we could all don pigskins and swim to the bloody Core.’

Adda waved the inflated skin in the supervisor’s face. ‘Wrong, City man. You people travel around in chariots hauled by pigs. At first I wondered if humans could travel in one of those all the way to the Core ... but of course the pigs could never survive the journey into the underMantle. So we *build* a pig ... an artificial pig, of wood and Corestuff. Strong enough to withstand the pressures of the underMantle.’

Seciv nodded. ‘How is this device to be propelled?’

Adda jabbed a finger at the pig’s jet orifice. ‘With jetfarts, of course. Like the real thing.’ He flicked the inflated fins. ‘And these will keep it stable.’ Now he pressed the skin between his arm and his bandaged ribs; Air squirted out of the jet orifice and the pig-corpse wobbled through the air in a ghastly, comic parody of life.

Hosch laughed out loud. ‘And where do the farts come from, upfluxer? You?’

Seciv frowned, his crumpled hair waving. ‘You could mimic the internal operation of the pig’s anatomy. The car could carry tanks of Air, heated by a stock of wood in a nuclear-burning boiler and expelled through a valve orifice.’ With a delicate finger he reached out and poked at one flabby fin, tentatively. ‘You could even make an attempt at steering, by mounting these fins on gimbals worked from inside the craft. And the fart nozzles could be

made directional, with a little ingenuity.' The old man nodded approvingly to Adda. 'A practical suggestion in many respects.'

Adda - despite himself, Dura realized - swelled at the praise; Hosch looked disgruntled.

Farr said seriously, 'But how could it survive the underMantle? Adda, I learned in the Bells that it's not pressure alone that would destroy such a craft, by crushing it ...' He snapped his fist closed suddenly, making Dura flinch; she wondered where he'd learned such crude dramatic tricks. Farr went on, 'Nuclear matter - ordinary matter - would dissolve.'

Hosch said rapidly, 'Well, of course it would. Anyone with a fingernail of experience knows that. Our Bells are protected from the pressure by magnetic fields sent down from the turbines in the City.'

Seciv Trop shook his head. 'That's a misapprehension, Supervisor. To be precise, the Bells are fed by *electrical currents* which are generated in the Harbour ... but the protective magnetic shell is generated at the Bell itself, by superconducting hoops which girdle the Bell.'

Hosch looked the old man up and down. 'You're a Fisherman, I suppose. We must have been on different shifts ...'

Muub touched Hosch's shoulder. 'Seciv designed the current generation of Bells - the Bells you ride every day. Hosch, your life depends upon his expertise; it suits you ill to mock him.'

Hosch subsided. 'Well, what of it? The boy's point stands.'

Seciv seemed impervious to offence. 'One would simply need to gird this artificial pig around with superconducting hoops, and carry equipment to generate the magnetic field from within.' He frowned. 'Of course, the bulk of the craft would be increased.'

Dura asked, 'Wouldn't it get hot inside the wooden pig, with nuclear burning going on all the time?'

Seciv nodded. 'Yes, that would be a difficulty ... though not in itself insurmountable. A more serious problem would be the supply of propellant Air. Compression ratios in even our best-made tanks are not very high. Sufficient for a jaunt to the ceiling-farms in an Air-car, but hardly enough for an expedition of this magnitude.' He eyed Adda sadly. 'Again, perhaps this could be overcome. But there are two far more devastating flaws. First, a lack of stability. There is more to an Air-pig than an anus and a few fins, after all. The pig has six eyes to guide it ...'

‘Well,’ Adda said defensively, ‘you could have six windows of clearglass. Or more.’

‘Perhaps. But the windows would each be manned by a pilot - yes? - who would then have to relay instructions to a crew - five or six men who would haul laboriously at the directing fins, hoping to adjust the motion. Adda, your wooden pig would flounder in the Air, I fear.’

Dura said, ‘But you don’t have to use fins. The thing doesn’t have to be exactly like a pig, after all. Maybe we could use jetfarts, coming from the sides of the pig.’

‘Yes.’ Muub looked thoughtful. ‘That could be far more precise.’

Seciv smiled indulgently. ‘Still, I would expect instability. Besides, I fear my second objection is fatal.’

Adda glared at him, his eye-leech slithering across his cheek.

‘Your mode of propulsion could not work within the underMantle, let alone the Quantum Sea. In high-pressure conditions Air could not be expelled; it would be forced back into the body of the pig.’

Hosch scratched his head. ‘I hate to be constructive about this stupid idea,’ he said, ‘but couldn’t you throw a magnetic field away from the pig’s hull? Then the farts would be expelled into Air at normal pressure.’

Seciv looked at him and ran bony fingers through his scraps of hair, evidently searching for a simple explanation. ‘But the expelled Air would still be inside the magnetic field, which in turn would be attached to the ship through the field lines. The Air would push at the magnetic shell, which would drag back the ship. It is a matter of action and reaction, you see ...’

Muub waved him to silence. ‘I think we can take your word for it, Seciv.’ He smiled at Adda. ‘Sir, the consensus seems to be that we can’t proceed with your suggestion; but it was ingenious, and perhaps - do you agree, Seciv? - some aspects of it may survive in a final design. Also, it sounds to me as if we could use this idea to make Air-cars of a different design from those we have at present - Air-cars which wouldn’t need pigs to draw them. None of the problems we’ve talked about would arise if the craft operated in the free Air, after all.’

Adda, clutching his retrieved pig with his one free arm, looked inordinately pleased with himself. Dura nudged him and said quietly,

‘You’re enjoying this. You’re forgetting you’re a miserable old bugger. You’ll confuse them.’

Adda glared at her. ‘Well? Who’s next? This Fisherman’s been so clever about my suggestions; now let’s hear what he has to say.’

‘Indeed. Hosch?’

The Harbour supervisor spread his empty hands, speaking only to Muub. ‘My idea is straightforward and I don’t need to send pigskins flying around to describe it. I say we stick to what we know. I say we extend the Spine ... but build it as long as we need it to be, down into the underMantle.’

Seciv Trop rubbed his chin. ‘Well, that has the merit of familiarity, as you say. The wooden Spine would need protecting against dissolution in the underMantle, but we could use superconducting coils to achieve that, as we do now ... But what an awesome undertaking it would be. I doubt if such a Spine could sustain its structural integrity on the lengthscale required. And it might affect the stability of the City itself. Could the anchor-bands sustain our position, here at the Pole, with such a counterweight?’

Muub was shaking his head. ‘Hosch, we can’t conceivably spare the resources for this. You must know the timber convoys from the Crust have dried up since the Glitch, so we’re not getting the wood. And we haven’t the manpower to spare, in any case ...’

‘Besides, Dura said, ‘what if a Glitch hit? The Spine would be so fragile it would be destroyed in moments.’

Hosch folded his arms and crossed his legs, turning his wiry body into a ball of finality. ‘Then it’s impossible. We may as well stop wasting our time and tell Hork so.’

Muub turned to him. ‘Frankly, Hosch, I won’t be sorry if that is our conclusion. I’d rather not waste any more time and effort on this fool’s errand than I have to.’

‘Oh, no.’ Seciv Trop’s creased face showed irritation. ‘We haven’t reached such a conclusion at all. We’ve merely eliminated possibilities. And we do, perhaps, have some of the elements of a workable solution.’

Muub looked sour, and he pulled at a thread in his robe. ‘Go on.’

‘First, we know that our hypothetical device - it will have to be some kind of free-floating Bell - will need a protective magnetic field, to keep it from dissolution, and some means of propulsion. It will have to be self-

sustaining; our traditional methods cannot be extended to such depths, so we've ruled out supply from the City. So the device would have to carry a simple turbine to generate a protective field.'

'How would it move?' Dura asked. 'I thought you said that jetfarts couldn't work.'

'And so they couldn't,' said Seciv. 'But there are other means of propulsion ...'

'Waving,' said Farr, his round face animated. 'What about that? Maybe we could make a Bell that could swim freely, a Bell that could Wave.'

'Exactly.' Seciv nodded, looking pleased. 'We could haul ourselves along the Magfield, exactly as we do when we Wave in the Air. Well done, young man.'

Muub pulled at his lower lip. 'But maybe the Magfield doesn't penetrate the underMantle.'

'We believe it does,' Seciv said. 'The underMantle and the Sea are permeated by charged particles - protons, electrons and hyperons - which sustain the Magfield.'

Hosch sneered. 'What would we do, attach a pair of false legs to the back?'

Farr - whose imagination seemed to have been caught - said excitedly, 'No, you'd Wave using coils of superconductor. Like the anchor-bands. You could move them from inside the Bell, and ...'

'Good thinking once more,' Seciv said smoothly. 'But you could go a little further. It wouldn't be necessary to move the coils themselves, physically; it is the movement of the current within them that could generate forward motion.'

Muub was nodding slowly. 'I see. So you'd make the current flow back and forth.'

'Have it alternate. Exactly. Then the coils could be fixed rigidly to the hull. And, of course, this design would have a certain economy: the craft's propulsion system would be one and the same as the magnetic shielding system.' He frowned. 'But we would still face the problem of the excessive heat in the interior of the craft generated by a nuclear-burning turbine in an enclosed space ...'

Hosch looked reluctant to speak, as if, Dura thought, he genuinely hated to contribute anything positive. 'But you wouldn't need to use nuclear

burning,’ he said at last. ‘Anything to power the turbine would be sufficient ... maybe even human muscles.’

‘No, I fear our muscles would be too feeble for such a task. But we *could* use the power of animals - a team of pigs, harnessed to some form of turbine - yes, indeed!’ He laughed and clapped Adda on the back, sending the old man spinning slowly like a bandaged fan. ‘So it seems after all that we will be riding pigs to the Core!’

Adda steadied himself, grinning widely.

Muub looked around the group. ‘I don’t believe it.’ He sounded disappointed. ‘I think we’ve come up with something we could build ... something that might actually work.’

Seciv pulled at his chin; Dura had never seen hands so bony and delicate. ‘We should build a prototype - there may still be unforeseen problems with the design. And, of course, once the descent begins the craft will encounter conditions we can only guess at.’

‘And then,’ Dura said, her spine prickling and cold, ‘there are the Colonists. In fact, the mission will be a failure if it doesn’t encounter the Colonists. What then?’

‘What indeed?’ Seciv echoed gravely.

Muub ran a hand over his bald head. ‘Damn you. Damn all of you. You’ve succeeded too well; I can’t justify reporting to Hork that this idea of his is impossible.’ He eyed the Harbour supervisor. ‘Hosch, I want you to take charge of the design and construction of a prototype.’

Hosch glared back resentfully, his thin face livid.

Muub said icily, ‘Call on these upfluxers, and you can have some of Seciv’s time. As for labour, use some of your workers from the Harbour. But keep it simple and cheap, will you? There’s no need to waste more of our energy on this than we have to.’ He turned in the Air, dismissing them. ‘Call me when the prototype’s ready.’

The Human Beings, arms loosely linked, followed Muub and the others slowly out of the Stadium.

‘So,’ Adda said. ‘A chance to confront gods from the past.’

‘Not gods,’ Dura said firmly. ‘Even the Xeelee aren’t gods ... But these Colonists could be monsters, if they exist. Remember the Core Wars.’

Adda sniffed. ‘This damn fool expedition will never get that far anyway. This Waving Bell will be crushed.’

‘Perhaps. But you needn’t be so stuffy, Adda. I know you enjoyed playing with ideas, back there. You have to admire the imagination, the spirit of these City folk.’

‘Well, what now?’ Adda asked. ‘Do you want to find your friend Ito?’

‘Later ... I have something to do first. I need to find someone - the daughter of a friend, from my ceiling-farm. A friend called Rauc.’

Adda thought about that. ‘Does the girl know what’s become of her mother?’

‘No,’ Dura said quietly. ‘I’m going to have to tell her.’

Adda nodded, his crumpled face expressionless, seeming to understand.

And one day, Dura thought, *I will have to go to the upflux forests, and tell Brow ...*

She glanced at Farr. The boy’s eyes were fixed on an indefinite distance, and his face was blank. She felt as if she could read his mind. *Humans were going to build a ship to find the Colonists*. It was indeed an idea full of wonder ... deep inside herself, too, she found, there was a small spark of awe.

And Farr was young enough to relish a ride.

But Adda was right. It was an utterly deadly prospect. And surely, she thought, as Hork’s ‘experts’ on the Xeelee, at least one of the three Human Beings would be assigned to the voyage, if it were ever made ...

She held Farr’s arm tight and pulled herself closer to him, determined that Farr should never make the journey he was dreaming of.

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18

Wakefulness intruded slowly on Mur.

Slowly, in shreds and shards, he became aware of the rustle of the Crust-trees, the tired stink of his own body, the endless yellow glow of the Air pushing into his closed eyecups. He'd used a few loops of frayed rope to bind himself loosely to a branch of an outlying tree, and now he could feel the undeniable reality of the ropes as they dug into the thin flesh of his chest and thighs.

Then the pain started.

His stomach, empty for so long, seemed to be slowly imploding, filling the centre of his body with a dull, dragging ache. His joints protested when he began to stir - stiff joints were a wholly unexpected side-effect of hunger, reducing his movements on bad days to those of an old man - and there was a sharp sheet of pain stretched round the inside of his skull, as if his brain were pulling away from the bone.

He jammed his eyes closed and wrapped his arms around himself, feeling his own bony elbows digging into his ribs. How strange it was that he had never slept more deeply in his life than in these impossibly difficult times. While waking life had become steadily more unbearable, sleep was ever more comfortable, seductive, a different realm in which his physical pain and mental distress dissolved.

If only I could stay there, he thought. *How easy it would be never to wake up again . . .*

But already the pain had dug too far into his awareness for that option to be available today.

With a sigh he opened his eyes and probed at the cups with one finger, working at rims sharp with crusty sleep deposits. Then he clambered slowly out of his loose sling of ropes. The rest of the Human Beings - the other fourteen - were scattered across the lower rim of the forest, bound by similar loops of rope. Dangling there half-asleep they looked like the pupae of insects, deformed spin-spiders perhaps.

Mur dropped out of the forest, avoiding the eyes of those others who were awake.

He stretched, his muscles still aching from yesterday's Waving. He pulled a handful of leaf-matter from the tree, and then flexed his legs and

Waved stiffly down into the Mantle. Perhaps twenty mansheights below the fringe of the forest ceiling he lifted his tunic and raised his legs to his chest. His hips and knees protested, but he grabbed his lower legs and pulled his thighs close to his stomach. At first his bowels failed to respond to this prompting - like the rest of his system his digestive and elimination processes seemed to be failing, slowly - but he persisted, keeping his arms wrapped around his legs.

At last his lower bowel convulsed, and - with a stab of pain which lanced through the core of his body - a hard packet of waste was expelled into the Air. He glanced down. The waste, floating down into the Mantle, was compact, too dark.

He cleaned himself with his handful of leaves.

Dia, his wife, came drifting down from the impromptu camp in the forest. As she descended, he saw how she was blinking away the remnants of sleep and compressing her eyecups against the brightness of the Air; but she was already - just moments after waking - squinting along the vortex lines into the South, towards the distant Pole, trying to assess how far they had come, how much further was left of this huge odyssey.

When she reached Mur she looked into his face, kissed him on the lips, and wrapped her arms around his chest. He folded his arms around her and rubbed her back. Through her shabby poncho he could feel the bones of her spine. They had nothing to say to each other, so they clung to each other, hanging in the silent Air, with the Quantum Sea spread below them.

Since Dura and the City woman had left in their Air-car - taking away the children, including their own Jai - the fifteen abandoned Human Beings had trekked across the Mantle towards the Pole. The slow pulsations of the vortex lines marked out the endless days of the journey. With no stores of food, the Human Beings were forced to follow the fringe of the Crust-forest; the leaves of the trees were scarcely nutritious, but they did serve to fool the body into forgetting its hunger for a while. Every few days their food ran out and they were forced to interrupt the march. There was some game to be had but the forest was unfamiliar, and the animals, still scared and scattered after the most recent Glitch, were wary and difficult to trap.

Without their own herd, the Human Beings were slowly starving to death. And on this hopeless trek, with its endless days of slow, painful Waving, the Human Beings were probably burning off their energy faster

than they could replace it. Mur couldn't forget the richness of the 'bread' Dura had brought to them, when she had come Waving out of the sky so unexpectedly with her startling stories of Cities in the Air.

Their progress round the Mantle's curve was imperceptible, a crushingly discouraging crawl. Every time he woke to another changeless Mantlescape Mur felt discouraged. And, even when the Pole was neared, the Human Beings would still have to cross the hinterland, the cultivated belt around the Pole. How would the inhabitants of those regions - themselves suffering after the Glitches - welcome this band of starving refugees as they came drifting beneath their ceiling-farms?

The logical thing for the Human Beings to do would be to give up this trek. Their best chance of survival would be to stay here, or even retreat a little further into the upflux, and try to establish a new home on the edge of the Crust-forest. Stop wasting their energies on this trek. They could build a new Net, establish a new herd of Air-pigs. They could even, he'd thought dizzily as he Waved across the silent Air, experiment with maintaining flocks of rays. The flesh of the ray was tough and not as palatable as Air-pig, but it softened when broiled using nuclear-burning heat; and the eggs were fine to eat and easy to store.

... But, of course, that wasn't possible; for their children had been taken from them, by well-meaning Dura, and transported to the South Pole. When he stared into the dull crimson glow of the Pole, in the far downflux, Mur felt as if a chain as long as a vortex line connected him directly to his child, a chain which dragged inexorably at his heart. Dura's action had surely been in the best interests of the children. But it left Mur knowing that his only chance of meeting his son again was to stay alive and to complete this trek, all the way to the City at the Pole.

He squeezed Dia once, and then they broke and prepared to return to the Crust-forest, to face the others and begin the day's work.

'Dia! Mur!' The voice, drifting down from the Crust-forest, radiated excitement.

Dia and Mur slowed their ascent, confused, and looked up. Philas was dropping towards them, her skinny legs pumping at the Air. When she reached the couple, she grabbed at their arms to stop herself.

Dia held Philas's shoulders. 'What is it? What's wrong?'

Philas, panting, the bones of her face prominent under her tied-back hair, shook her head. ‘Nothing’s wrong. But ... look. Look down there.’ She pointed, down past their feet into the Mantle.

The three of them separated and tipped forward in the Air. Mur peered down, trying to follow the direction of Philas’s gesture. He saw the orderly array of vortex lines, the dull purple bruise of the Quantum Sea beyond the crystalline Air. There seemed nothing unusual, except ...

There. A small, dark knot in the Air, a hint of motion.

He turned to Dia. ‘Your eyes are sharper than mine. What is it?’

‘People,’ she said, squinting down. ‘A group of them. Twenty or thirty, maybe. It looks like an encampment. But there’s something at the centre ...’

‘What?’

Philas thrust her face forward at Dia. ‘Do *you* see it?’

‘I think so,’ Dia said slowly. Her eyes narrowed. ‘But it might not mean anything, Philas ...’

Mur was baffled. ‘What is it? What do you see?’

Uncertainty and fear creased Dia’s small, pretty face. ‘It’s a tetrahedron,’ she said.

The fifteen Human Beings gathered on the lower edge of the forest and debated what to do. Dia, fearful, uncertain, thought they shouldn’t waste time on this chance encounter; she wanted simply, to continue with the slog to the Pole. Mur sympathized. The Human Beings were already divided, listless, growing steadily more apathetic. It was becoming ever harder to maintain the momentum of this trek across the Mantle; and once that momentum was gone, it might be impossible to regain.

They would be stranded, wherever they stopped. And that, of course, would be unbearable for those with children at the Pole.

Philas and others argued strongly for doing something. ‘Think about it,’ she said vehemently, her thin arms raised over her head as she spoke, her fingers spread wide. ‘What if that really is a wormhole Interface, left over from the past? What if it’s still working?’

‘That’s impossible,’ Dia said. ‘The Interfaces were taken down into the Core, by the Colonists after the Core Wars.’

‘The Mantle is a big place,’ someone said. ‘Maybe some of the Interfaces were left functioning. Maybe ...’

‘Yes,’ Philas said eagerly, ‘just think of that. We know that in the days before the Wars Human Beings could cross the Mantle in huge bounds, using the wormholes. If that is a working Interface down there we might complete this impossible journey in a heartbeat!’

Mur looked around at faces rendered sharp by hunger and exhaustion. Philas was weaving a dream of abandoning this ghastly journey, to reach their goal in moments with the aid of magical ancient technology. It was seductive, compelling, all but irresistible.

Despite his loyalty to Dia, he felt himself falling under the spell of that dream.

‘There are already people there,’ he said slowly. ‘Around the Interface. If it is an Interface. Who’s to say how they will react to us? Will they simply let us walk up and wander through?’

‘Maybe they’re Colonists,’ Philas said.

‘Anyway,’ said someone, ‘we won’t know unless we go to find out ...’

There was a murmur of agreement. Dia dropped her head. Philas and Mur were named as scouts, to go ahead to the artifact and investigate, leaving the rest of the Human Beings in the forest until their return.

Mur tried to comfort Dia. ‘It won’t take us long. And perhaps ...’

‘Perhaps what?’ She stared at him bitterly. ‘Perhaps there are wizards there who can restore little Jai to us. Is that what you expect?’

‘Dia ...’

She seemed to slump, as if the Air was collapsing out of her. ‘We’re going to spend the rest of our lives here. Right here. Dying off one by one. Aren’t we, Mur?’

Philas and Mur dived away from the forest and into the Mantle. The tetrahedral artifact might be as much as a half-day away, so they each carried a bag containing a little of the tribe’s precious, and dwindling, supply of pig-meat.

At first Mur looked back frequently into the Crust-forest. Dia’s face, turned down like a small, round leaf, followed them as they descended, her expression soon too distant to read. Then she ducked back into the forest. For a while Mur was able to follow the movements of the other Human Beings as they worked through the forest, using the time to hunt and to repair damaged tools, ropes and clothes. But at last the site of the Human

Beings' temporary camp was lost in the swirling, complex tapestry of trunks and branches that made up the Crust-forest.

Mur spent some time staring up at the forest, carefully committing the pattern of trunks to memory so they could find the Human Beings again.

Philas descended towards the artifact without speaking. Her thin face was intent on the goal, empty of expression; Mur hadn't seen her so focused since the death of Esk. She dug into her pouch and, with efficient regularity, bit into a piece of meat.

Mur, alone with his thoughts, fell through the vortex lines. The artifact, and the little colony around it, grew in his vision tantalizingly slowly. But it wasn't long before he could see without ambiguity that the artifact was indeed a tetrahedron, around ten mansheights to a side.

The story of the Colonists, and their Core Wars, was part of the lore of the Human Beings. When the Ur-humans first reached the Star, having travelled from their own unimaginable worlds, the Star was empty of human life. The Colonists had been the first generation to be established within the Star, by the Ur-humans. It had been their task to spawn the first of the Star's true inhabitants: all of them, the mortal, frail ancestors of the Human Beings, the people of Parz and the hinterland, all the inhabitants of the Mantle.

Compared to Human Beings the Colonists had been like gods. They had more in common with the Ur-humans, perhaps, Mur speculated. With Ur-human technology they had pierced the Mantle with wormhole links and established huge Cities which had sailed through the Mantle in vast, orderly arrays. The first generations of Human Beings had worked with their progenitors, travelling the wormhole links and building a Mantle-wide society.

Then the Core Wars had come.

As they neared the artifact, and the irregular little settlement around it, excitement gathered in Mur. Fatigue and hunger worked on him as he Waved, and he became aware that his thinking was becoming looser, more fragmented. His head seemed filled with visions, with new hopes; and the aches of his tired, protesting body seemed to fade. Could these really be Colonists, this artifact a fragment from the magical past?

He wanted to believe. He was tired - so tired - of pain, of death, of scraping his marginal existence from the unforgiving Air. To discover a

Colonist artifact would be like returning to the arms of long-dead parents.

Glancing across at Philas, he recognized the same hunger to believe - to find a home - in her expression, the set of her body as she Waved.

With perhaps five hundred mansheights separating them from the artifact, two people broke from the grouping around the tetrahedron. The two came Waving cautiously up to meet Philas and Mur.

Mur slowed, and moved closer to Philas.

The pair from the tetrahedron halted a dozen mansheights below the Human Beings. They were a man and a woman, and they carried spears of wood. The woman came up a little further, and pointed her spear at Mur's belly. 'What do you want?'

Mur inspected the woman. She must have been aged around forty. The spear was well crafted, but it was just a spear - nothing more sophisticated than a sharpened stick of wood, nothing the Human Beings couldn't have manufactured for themselves. The woman wore a crude, pocketed poncho of what looked like pig-leather, and a wide-brimmed hat. Folds of cloth were tied up around the rim of the hat. The woman was well muscled but scrawny; her face was wide and flat, disfigured by a scowl. 'Well?' she demanded. 'Deaf, are you?'

Mur sighed, disappointment gathering in him. He turned to Philas. 'Obviously, these aren't Colonists.'

'Who are they, then?'

'How should I know?' he snapped back, irritated.

He moved forward a little, with arms spread wide, hands empty. 'My name is Mur. This is Philas. We're - refugees.' He decided not to mention the rest of the Human Beings. 'We lost all we possessed in the Glitch. We're trying to get to Parz City. Do you know it?'

The woman's eyes narrowed; she didn't reply. She raised the spear uncertainly and poked it towards Mur's stomach again, substituting aggressiveness for an answer.

'We're wasting our time,' Mur whispered to Philas. But Philas had broken away from him and was Waving down with irregular, trembling strokes of her thin legs towards the strangers.

'You have an Interface,' she said.

The man, similarly grimy and scowling, a little younger than the woman, joined his companion. He too was wearing a battered, wide-

brimmed hat. They stared at the Human Beings as suspiciously, thought Mur, as a pair of tethered Air-pigs.

‘Please,’ Philas said. ‘We’ve come a long way. We’re trying to reach the Pole. Can we ...’ She stumbled over her words, as if she’d become suddenly aware of how foolish they sounded. ‘Will your Interface help us?’ She looked from one to the other. ‘Do you understand what I’m asking?’

The man opened a mouth devoid of teeth and laughed, but the woman laid a restraining hand on his arm. Her voice remained stern, but it softened a little. ‘Yes, I understand. And you’re right; it is an Interface - from the olden days, from before the Core Wars. But you can’t use it.

Philas was trembling. ‘We’ll pay,’ she said wildly. ‘You must ...’

Mur grabbed her shoulders and tried to still her shivering with his own inertia. ‘Stop it, Philas. Don’t you understand? Even if we could pay, *the Interface doesn’t work any more*. These people are as helpless as we are.’

Philas stared into his face resentfully, then turned away; her body was wracked by shuddering.

The man and woman watched them curiously.

Mur turned to them wearily. ‘Why don’t you put away your weapons? You can see we’re no threat to you.’

They lowered their spears carefully, but kept them aimed roughly in the direction of the Human Beings. The man said, ‘You really are refugees from further upflux?’

‘Yes. And we really are trying to reach a place called Parz City, which we’ve never seen. But it’s at the Pole.’

‘Which Pole?’ the woman asked. ‘The South Pole?’

The man cackled. ‘If you’re starting from here it hardly matters, does it?’

‘Oh, shut up, Borz,’ the woman said.

Mur put his arm around Philas. ‘Will you let us see your Interface?’

To his shame, he read amused pity in the woman’s expression. ‘If you want,’ she said. ‘But stay close to the two of us. Do you understand? We see enough thieves and beggars ...’

‘We’re no beggars,’ Philas said with a spark of spirit. She drew away from Mur and pulled her shoulders straight. ‘Come, then.’

Borz and the woman turned away from them and separated by a couple of mansheights. Hand in hand, Mur and Philas Waved cautiously forward.

Soon they were approaching the artifact, shepherded by spears and scowls.

Mur squeezed Philas's hand. 'You should have said we weren't thieves,' he whispered. 'I was thinking of trying a little begging.'

She managed a small laugh. 'It wouldn't have worked. These people have no more than we have ... or had, before we lost our home.' She pointed at Borz, to their left. 'Look at the hat he's wearing.'

The hat's brim was piled with pleats of fine material, knotted into place by ties fixed through holes in the leather of the hat. Mur imagined undoing those ties; perhaps a kind of net would drop down, around the head.

'It's odd, but what about it?'

'Remember Dura's tales of her time on the ceiling-farm. The Air-tanks they made her wear, working high up, close to the Crust. The masks ...'

'Oh. Right.' Mur nodded. 'Those hats must have come from coolies' Air-tanks.'

'So my guess is these people used to be coolies. Maybe they ran away.'

'But they ought to know about Parz.'

Philas laughed without humour. She seemed in control of herself again, but her mood was black. 'So they are concealing things from us. Well, we lied to them. That's what the world is like, it seems.'

Mur stared at Borz's hat. Apart from Deni Maxx's Air-car it was the first artifact even remotely related to the City he'd ever seen. And recognizing it now from Dura's description somehow lent veracity to Dura's bizarre tale. He felt oddly reassured by the confirmation of this small detail, as if somewhere inwardly he'd imagined Dura might be lying, or mad.

The people turned to stare, suspicious and hostile, as the Human Beings were brought into the encampment by Borz and his companion. There seemed to be around forty humans in the little colony, perhaps fifteen of them children and infants. The adults were fixing clothes, mending nets, sharpening knives, lounging in the Air and talking. Children wriggled around them like tiny rays, their bare skins crackling with electron gas. None of it would have looked out of place in any of the Human Beings' encampments, Mur thought.

The tetrahedral artifact loomed beyond the small-scale human activities. It was a skeletal framework, incongruous, sharp, dark.

Borz and the woman hung back as Mur and Philas hesitantly approached the tetrahedron's forbidding geometries. Mur peered up at the framework. The edges were poles a little thicker than his wrist, each about ten mansheights long. They were precisely machined of some dull, dark substance. The four triangular faces defined by the edges enclosed nothing but ordinary Air - in fact, the people here had slung sections of net to enclose a small herd of squabbling, starved-looking Air-pigs at the framework's geometric centre. Elsewhere on the framework rough bags had been fixed by bits of rope; irregular bulges told Mur that the bags probably contained food, clothes and tools.

Mur moved forward, reached out a tentative hand and laid his palm against one edge. The material was smooth, hard and cold to the touch. Maybe this was the Corestuff of which Dura had spoken, extracted from the forbidding depths of the underMantle by City folk (and now, unimaginably, by the boy Farr whom Mur had grown up with).

Philas asked, 'Can we go inside?'

The woman laughed. 'Of course you can. Your friend was right ... nothing works, any more.'

The man grunted to Mur. 'We'd hardly keep our pigs in there if they were going to be whisked off to the North Pole at any moment.'

'I imagine not.'

Philas passed cautiously through one face of the tetrahedron. Mur saw her shiver as she crossed the invisible plane marked by the edges. She hovered close to the pigs and turned in the Air, peering into the corners of the tetrahedron.

The man - Borz - grunted. 'Oh, what the hell.' He dug into one of the bags dangling on the tetrahedral frame and extracted a handful of food. 'Here.'

Mur grabbed the food. It was stale, slightly stinking Air-pig flesh. Mur allowed himself one deep bite before stuffing the rest into his belt. 'Thank you,' he said around the mouthful of food. 'I can see you've little to spare.'

The woman drifted closer to him. 'Once,' she said slowly, 'this frame sparkled blue-white. As if it was made of vortex lines. Can you imagine it? And it really was a wormhole Interface; you could pass through it and cross the Mantle in a heartbeat.' For a moment she sounded sad - nostalgic for

days she'd never seen - but now her dismissive expression returned. 'So they say, anyway. But then the Core Wars came ...'

After raising several generations of Human Beings, the Colonists had suddenly withdrawn. According to the Human Beings' fragmented oral histories the Colonists had retreated into the Core, taking most of the marvellous Ur-human technology with them, and destroying anything they were forced to leave behind.

The Human Beings had been left stranded in the Air, helpless, with no tools save their bare hands.

Perhaps the Colonists had expected the Human Beings to die off, Mur wondered. But they hadn't. Indeed, if Dura's tales of Parz and its hinterland were accurate, they had begun to construct a new society of their own, using nothing but their own ingenuity and the resources of the Star. A civilization which - if not yet Mantle-wide - was at least on a scale to bear comparison with the great days of the ancients.

'The wormholes collapsed,' the woman said. 'Most of the Interfaces were taken away into the Core. But some of them were left behind, like this one. But its vortex-light died. Now it just drifts around in the Magfield ...'

'I wonder what happened to the people inside the wormholes,' Mur said. 'When the holes collapsed.'

Philas came drifting out of the tetrahedron. 'Come on, Mur,' she said tiredly.

Mur thanked Borz for the scrap of food, and nodded to the woman - whose name, he realized, he'd never learned.

The pair barely reacted, and their scowls seemed to be returning. Their spears had never left their hands, Mur noticed.

They Waved out of the little encampment. A child jeered at them, until silenced by a parent; Mur and Philas didn't look back.

They began to Wave upwards, side by side.

Mur gazed up at the Crust-forest. 'That seems a hell of a long way back,' he said. 'To have come all this way, for a handful of meat ...'

'Yes,' Philas said savagely, 'but we might have found riches. Riches beyond imagining. We had to come.'

'I wonder why they stay here, close to the Interface. Do you think it protects them, when Glitches come?'

‘I doubt it,’ Philas said. ‘After all, the thing floats freely, they said. It’s just a relic, a ruin from the past.’

‘Then why do they stay?’

‘For the same reason Dura’s City folk built their City at the Pole.’ Philas waved her hands at the empty Mantlescape, the arching vortex lines. ‘Because it’s a fixed point, in all this emptiness. Something to cling to, to call home.’ She wiped her eyes with the back of her hand; already she seemed short of breath. ‘Better than drifting, like we do. Better than that.’

Mur lifted his face to the Crust-forest and Waved hard, ignoring the gathering ache in his hips, knees and ankles.

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19

Dura made sure it was she, not Farr, whom Hork chose to go on the journey into the underMantle. At first Adda tried to explain Dura's reasoning to Farr, to provide a bridge between them; but he could see that Farr was devastated. The boy mooched around the Upside apartment Hork had loaned the Human Beings like a trapped Air-pig. Adda wistfully watched him prowl, recalling Logue as a young man. The underMantle journey had many potent elements for Farr - the chance to protect his sibling by taking her place, the intrinsic excitement of the jaunt itself. Farr was still such a melange of boy and man.

But - if one of the three Human Beings must go on this absurd trip - then Dura was the best choice. Farr didn't have the maturity, or Adda himself the strength, to cope with the challenges the journey would provide ...

Adda cursed himself silently. Even in the privacy of his own mind he was starting to use the diluted language of the City folk, to be influenced by their grey thinking. Into the Core with that.

The truth was that whoever went down inside this ramshackle craft into the underMantle would almost certainly die there. Dura's qualification was only that she, of the three of them, had the skills and strength marginally to reduce that level of certainty.

So, knowing Dura's decision was right, Adda gave up trying to convince Farr. Instead he tried to support the decision in Farr's mind in subtle ways - by taking the decision as a given, not even trying to justify it. He concentrated on trying to distract Farr from his anxious, angry concern for his sister, which wound up tighter as the day of the Mantle-craft's launch neared. To this end Adda was pleased with the friendships Farr had made in his brief time in the City - with Cris, and the Fisherman Bzya - and tried to encourage them.

When Cris offered to take Farr Surfing again Farr at first refused, unwilling to break out of his absorption with Dura; but Adda pressed him to accept the invitation. In the end it was a little party of four - Cris, Farr, Adda and Bzya - who set off, two days before Dura's launch, through the corridors for the open Air.

Adda had taken a liking to the huge, battered Fisherman, and sensed that Bzya had given Farr a great deal of support - more than Farr realized, probably - during Farr's brief time in the Harbour. Now Farr was free of his indenture, thanks to the whim of Hork V, and - here was the boy showing his immaturity again, Adda reflected - now he seemed to sympathize little with Bzya, who was stuck with the situation Farr had escaped - the huge, stinking halls of the Harbour machines, and the depths of the underMantle. Instead, Farr complained at how little he saw of Bzya.

Adda had no qualms in accepting Bzya's help as they made their way through the busy corridors; the presence of Bzya's huge arm guiding him was somehow less patronizing, less insulting, than any other City man's.

As they travelled out from the core of the City the street-corridors became barer, free of doors and buildings, and the Air more dusty. At last they reached the Skin. It was dark, deserted here, almost disquietingly so, and the City hull stretched above and below them. Adda surveyed the workmanship critically: curving sheets of crudely cut wooden planks, hammered onto a thick framework. It was like being in the interior of a huge mask. From without, the City was imposing, even to a worldly-wise upfluxer like himself; but seen from within, its primitive design and construction were easy to discern. These City folk really weren't so advanced, despite their facility with Corestuff; the Ur-humans would surely have laughed at this wooden box.

They Waved slowly along the Skin, not speaking, until Cris brought them to a small doorway, set into the Skin and locked by a wheel. With Bzya's help Cris turned the stiff wheel - it creaked as it rotated, releasing small puffs of dust - and shoved the door open.

Adda hauled himself through the doorframe and into the open Air. He Waved a few mansheights away from the City and hovered in the Air, breathing in the fresh stuff with a surge of relief. The party had emerged about halfway up the rectangular bulk of the City - in the *Midside*, Adda reminded himself - and the skin of Parz, like the face of a giant, cut off half the sky behind him. The imposing curve of a Longitude anchor-band swept over the rough surface a few dozen mansheights off; electron gas fizzed around the band's Corestuff flanks, a visible reminder of the awesome currents flowing through its superconductor structure.

Adda's lungs seemed to expand. The vortex lines crossed the shining sky all around him, plunging into the crimson-purple pool that was the Pole beneath the City. The Air here was thick and clammy - they were right over the Pole, after all - but inside the City he always had the feeling he was breathing in someone else's farts.

The two boys tumbled away into the Air, hauling the Surfboard; Adda was pleased to see Farr's natural, youthful vigour coming to the surface as he Waved energetically through the Air, responding to the refreshing openness. Bzya joined Adda; the two older men hung in the Magfield like leaves.

'That door was a little stiff,' Adda said dryly.

Bzya nodded. 'Not many City folk use the pedestrian exits.'

Pedestrian. Another antique, meaningless word.

'Most of 'em never leave the City walls at all. And those that do - because they have to, like your ceiling-farmer friend - take their cars.'

'Is that a good thing, do you think?'

Bzya shrugged. He was wearing a scuffed, ill-fitting coverall, and under its coarse fabric his shoulder muscles bunched like independent animals. 'Neither one nor the other. It's just the way things are. And always have been.'

'Not always,' Adda murmured. He gazed around the sky with his good eye and sniffed, trying to assess the spin weather. 'And maybe not forever. The City isn't immune to the changes wrought by these unnatural Glitches. Even your great leader Hork admits that.'

Bzya nodded at the boys. 'It's good to see Farr looking a bit happier.'

'Yes.' Adda smiled. 'The body has its wisdom. When you're doing barrel-rolls in the Air, it's hard to remember your problems.'

Bzya patted his ample gut. 'I wish I could remember doing barrel-rolls even. Still, I know what you mean.' Now Cris had set up his board. Farr rested it against the soft, even resistance of the Magfield and Cris set his feet on it, flexing his legs experimentally. Adda saw the boy's muscles bunch as he pressed against the Magfield; his arms were outstretched and his fingers seemed to tickle at the Air, as if assessing the strength and direction of the Magfield. Farr pushed him off, recoiling through a mansheight or so, and Cris rocked the board steadily. He slid through the

Air with impressive speed and grace; boy and board looked like a single entity, inseparable.

Cris performed slow, elegant turns in the Air; then - with a thrust at the board and a swivel of his feet almost too fast for Adda's rheumy eye to follow - he swept up and over, looping the loop in a single, tight motion. The boy flew across the blind face of Parz City, electron gas sparkling blue about his gleaming board.

He came to rest close to Bzya and Adda, and stepped away from his board gracefully. Farr Waved over to join them. Still a little dazzled by Cris's prowess, Adda saw the contrast with Farr: the Human Being had innate, Pole-enhanced strength, but beside Cris's athletic grace he looked clumsy, massive and uncoordinated.

But then, Farr hadn't had the luxury of a lifetime playing games in the Air.

'You ride that thing well.'

'Thanks.' Cris dipped his head with its oddly dyed hair; he seemed acceptably unself-conscious about his skill. 'And you're in the Games, I hear,' Bzya said.

Adda frowned. 'What Games?'

'They come once a year,' Farr said eagerly. 'Cris has told me about them. Sports in the Air - Surfing, the Luge, aerobats, Wave-boxing. Half the people in the City go out to the Stadium to watch.'

'Sounds fun.'

Bzya poked Adda in the ribs with a sharp thumb. 'It is fun, you old fogey. You should go along if you're still here.'

'It's more than fun.' Cris's tone was deeper than normal, earnest; Adda studied him curiously. Cris was a good boy, he had decided - shallow, but a decent friend to Farr. But now he sounded different: he was intense, his eyecups deep and dark.

Bzya said to Adda, 'The Games can make a big difference, for a talented young man like Cris. A moment of fame - money - invitations to the Palace ...'

'This is the third year I've had an application in for the Surfing,' Cris said. 'I've been in the top five in my age group all that time. But this is the first time they've let me in.' He looked sour. 'Even so, I'm unseeded. I've got a lousy draw, and ...'

Adda was aware of Farr hovering awkwardly close to them, his callused hands heavy at his sides. The contrast with Cris was painful. ‘Well,’ he said, trying not to sound hostile to the City boy’s prattle, ‘you should get your practice done, then.’

The boys peeled away once more. Cris mounted his board and was soon sweeping through the Air again, an insect sizzling with electron gas before the face of Parz; Farr Waved in his wake, calling out excitedly.

‘Don’t be hard on the boy,’ Bzya murmured. ‘He’s a City lad. You can’t expect him to have much sense of perspective.’

‘The Games mean nothing to me.’

Bzya swivelled his scarred face to Adda. ‘But they mean everything to Cris. To him, it’s a chance - maybe his only chance - of breaking out of the life that’s been set out for him. You’d have to have a heart of Corestuff, man, not to sympathize with the boy for trying to change his lot.’

‘And what then, Fisherman? After his few moments of glory - after the grand folk have finished using him as their latest toy. What will become of him then?’

‘If he’s smart enough, and good enough, it won’t end. He can parlay his gifts into a niche in the Upside, before he gets too old to shine on the Surfboard. And even if not - hell, it’s a holiday for him, upfluxer. A holiday from the drudgery that will make up most of his life.’

There was a shout from above them. Cris had ridden his board high up the City’s face, and was now sweeping through the sparkling Air close to the Longitude band. Electron gas swirled around his board and body, crackling and sparking blue. Other young people - evidently friends of Cris - had joined them, appearing from cracks in the Skin as if from nowhere - or so it seemed to Adda - and they raced around the Longitude band like young rays.

‘They shouldn’t do that,’ Bzya murmured. ‘Against the law, strictly speaking. If Cris goes too close to the Longitude the flux gradients could tear him apart.’

‘Then why’s he doing it?’

‘To learn to master the flux,’ the Fisherman said. ‘To learn how to conquer the fiercer gradients he’ll find when he’s in the Games, and he Surfs across the face of the Pole.’

Adda sniffed. ‘So now I know how you choose your rulers - on whether they can balance on a bit of wood. No wonder this City’s such a damn mess.’

Bzya’s laughter echoed from the blank, crudely finished wall of the City. ‘You don’t like us much, do you, Adda?’

‘Not much.’ He looked at Bzya, hesitating. ‘And I don’t understand how you’ve kept your sense of humour, my friend.’

‘By accepting life as it is. I can question, but I can’t change. Anyway, Parz isn’t some kind of huge prison, as you seem to imagine. It’s home for a lot of people - it’s like a machine, designed to improve the lives of young people like Cris.’

‘Then the machine’s not bloody working.’

Bzya said calmly, ‘Would you exchange Farr’s life and experiences, to date, for Cris’s?’

‘But Cris’s thinking is so narrow. The Games, his parents ... as if this City was all the world, safe and eternal. Instead of ...’ He searched for the words. ‘Instead of a box, lashed up from old lumber, floating around in immensity ...’

Bzya touched his shoulder. ‘But that’s why you and I are here, old man. To keep the world away from boys like Farr and Cris - to give them a place that seems as stable and eternal as your parents did when you were a child - until they are old enough to cope with the truth.’ He turned his scarred face to the North, staring into the diverging vortex lines with a trace of anxiety. ‘I wonder how much longer we’re going to be able to achieve that.’

Again and again, Cris Mixxax looped around the huge Corestuff band.

It was the day of the launch. The down-gaping mouth of the Harbour, here in the deepest Downside of the City, framed clear, yellow Air. A few people Waved beneath the entrance and peered up into the dark. Engineers talked desultorily as they waited for Hork to arrive, and to begin the launch proper. There was a smell of old, splintering wood.

Dura clung to a rail close to the lip of the access port, keeping to herself. She had already said her goodbyes. Toba had cooked them a fine meal in his little Midside home, but it had been a difficult occasion; Dura had had to work hard to break through Farr’s resentful reserve. She’d asked Adda, quietly, to keep Farr away from the launch site today. She’d have enough to think about without the emotional freight of another round of farewells.

Even, she thought, wrapping her arms around her torso, if they turned out to be final farewells.

She looked down at the craft, studying lines which had become familiar to her in weeks of designing, building and testing. Hork V had decided to call his extraordinary craft the ‘Flying Pig’. It was a clumsy, ugly name, Dura thought; but it caught the essence, maybe, of a clumsy, ugly vessel. The ship as finally constructed - after two failed prototypes - was a squat cylinder two mansheights across and perhaps three tall. The hull, of polished wood, was punctured by large, staring windows of clearwood. There were also clearwood panels set into the upper and lower cross-sections of the cylinder. The whole craft was bound about by five hoops of sturdy Core-matter. The Air-pigs whose farts would power the vessel could be seen through the windows, lumps of straining, harnessed energy. The ship was suspended by thick cables from huge, splintered pulleys which - on normal days - bore Bells down towards the Quantum Sea.

This, then, was the craft which would carry two people into the lethal depths of the underMantle. In the dingy, dense Air of the City’s Harbour the thing looked sturdy enough, Dura supposed, but she doubted she’d feel so secure once they were underway.

There was a disturbance above her, a sound of hatches banging. Hork V, Chair of Parz City, resplendent in a glittering coverall, descended from the gloom above. He seemed to glow; his bearded face was split by a huge smile. Dura saw that Physician Muub and the engineer Seciv Trop followed him. ‘Good day, good day,’ Hork called to Dura, and he clapped her meatily on the shoulder-blade. ‘Ready for the off?’

Dura, her head, full of her regrets and fears, turned away without speaking.

Seciv Trop wafted down, coming to rest close to her. He touched her arm, gently; the many pockets of his coverall were crammed, as usual, with unidentifiable - and probably irrelevant - items. ‘Travel safely,’ he said.

She turned, at first irritated; but there was genuine sympathy in his finely drawn face. ‘Thanks,’ she said slowly.

He nodded. ‘I understand how you’re feeling. Does that surprise you? - crusty old Seciv, good for nothing without his styli and tables. But I’m human, just the same. You’re afraid of the journey ahead ...’

‘Terrified would be a better word.’

He grimaced. ‘Then at least you’re sane. You’re already missing your family and friends. And you probably don’t expect to make it back, ever.’

She felt a small surge of gratitude to Seciv; this was the first time anyone had actually voiced her most obvious fear. ‘No, frankly.’

‘But you’re going anyway.’ He smiled. ‘You put the safety of the world ahead of your own.’

‘No,’ she snapped. ‘I put my brother’s safety ahead of my own.’

‘That’s more than sufficient.’

As she had suspected, the City men had insisted on one of the Human Beings taking this trip. Adda was ruled out because of age and injury. Farr’s omission - which came to his frustration - hadn’t been a foregone conclusion; his youth, in the eyes of those making the decisions, had barely outweighed his experience as a novice Fisherman. Dura had been forced to argue hard.

The second crewman had been a surprise: it was to be Hork, Chair of Parz, himself. Now Hork was moving around the bay, glad-handing the engineers. Dura watched his progress sourly. He must be subject to the same fears as herself; and - in recent months anyway - to enormous personal pressure - and yet he looked relaxed, at ease, utterly in command; he had a natural authority which made her feel small, weak.

‘He wears his fear well,’ she said sourly.

Seciv pulled at the corner of his mouth. ‘Perhaps. Or perhaps his fear of not taking the voyage, of remaining here, is the greater. He is gambling a great deal on this voyage, you know.’

This stunt ... Yes, Dura did know; she’d become immersed enough in the politics of Parz to be able - with the help of Ito and Toba - to understand something of Hork’s situation. However unreasonable it might be, the citizens of Parz expected Hork to resolve their troubles - to lift food rationing, to restore the lumber convoys and get the place working again. To open the *shops*, damn it. That he’d manifestly failed to do so (but how could he have succeeded?) had put his position in doubt; there were factions in his Court and on the larger Committee who were gunning for him, with varying degrees of openness.

This ludicrous jaunt into the underMantle was Hork’s last gamble. All or nothing. If it succeeded then he, Hork, would return as the saviour of the City and all the peoples of the Mantle. But if it failed - well, Dura thought

uneasily, perhaps it would be better for Hork to die in a glorious instant, in the deep underMantle, than at the hands of an assassin here in the bright corridors of Parz.

The crew members had to climb into the ship through a hinged hatch set in the upper end of the cylinder. Hosch, the former Harbour supervisor, had been checking the craft's simple systems; now Dura watched his thin, hunched shoulders emerge from the craft through the crew hatch. As Muub had expected, Hosch had turned out to be a good manager of the construction project, despite his sour personality; he'd been able effectively to draw out the mercurial expertise of the likes of Seciv Trop and to marry it to the practical skills of his Harbour engineers.

Hosch glanced up, saw that both Dura and Hork were ready. 'It's time,' he said.

Dura felt something within her recede. As if in a dream she watched her own hands and legs working as she clambered down towards the ship.

She climbed stiffly through the hatch and into the interior, squeezing past the row of bound, straining Air-pigs and the sleek turbine beside them. She experienced a mixture of gratified relief at being underway, and a tang of sheer, awful terror.

With bellowed goodbyes to the engineers, to Muub, Seciv and the rest, Hork shook Hosch's thin hand and clambered into the cabin, squeezing his sparkling bulk through the hatch. He seemed careless of the pollution of his gleaming suit by the dirt of the pigs. He dragged the hatch closed after him and dogged its wooden latches tight.

For a moment Hork and Dura hovered close to the hatch, alone in there for the first time. Their eyes met. *Now*, Dura thought, *now the two of them were bound to each other, for good or ill.* She could see a slow, appraising awareness of that in Hork's expression. But there was little fear there; she read humour, enthusiasm.

By the blood of the Xeelee, she thought. *He's actually enjoying this.*

Without speaking they descended into the craft.

The pigs were strapped in place close to the top of the cylinder. Dura climbed into her loose harness close to the pigs. The walls of the cabin were fat with Air-tanks, food stores, equipment lockers and a primitive latrine. Cooling fans hummed and wood-lamps, their green glow dim, studded the walls.

Towards the base of the ship Hork took his place at the craft's simple control panel, a board placed before one of the broader windows and equipped with three levers and a series of switches. He rolled his sleeves back from his arms with every evidence of relish.

There was a pounding on the hull.

Hork thumped back enthusiastically, grinning through his beard. 'So,' he said breathlessly, 'so it begins!'

The craft jolted into motion. Dura heard a muffled cheer from the engineers in the Harbour, the creaking of the pulleys as they began to pay out cable.

After a few seconds the craft emerged from the Harbour. The golden brilliance of Polar Air-light swept the interior of the ship, filling Dura with a nostalgic, claustrophobic ache. The silhouetted forms of Waving people - some of them children - accompanied the craft as it began its descent from the City.

Hork was laughing. Dura looked down at him, disbelieving.

'Oh, come on,' Hork said briskly. 'We're off! Isn't this a magnificent adventure? And what a relief it is to be *doing* something, to be going somewhere. Eh, Dura?'

Dura sniffed, letting her face settle into sourness. 'Well, Hork, here I am going to hell in the belly of a wooden pig. It's a bit hard to find much to smile about. With respect. And we do have work to do.'

Hork's expression was hard, and she felt briefly uneasy - she'd been around him long enough now to witness several of his towering rages. But he merely laughed aloud once more. His noisy, exuberant presence was overwhelming in the cramped cabin; Dura felt herself shrink from it, as if escaping into herself. Hork said, 'Quite right, captain! And isn't it time you started working the pigs?'

He was right; Dura swivelled in her sling to begin the work. The craft wouldn't be cut loose of the Harbour cable for some time, but they needed to be sure the internal turbine and the magnetic fields were fully functioning. The animals' harness, slung across the width of the cabin, kept the pigs' rears aimed squarely at the wide blades of a turbine. A trough carved from unfinished wood had been fixed a micron or so before the pigs' sketchy, six-eyed faces, and now Dura took a sack of leaves from a locker and filled the trough with luscious vegetable material, crushing the stuff as

she worked. Soon the delicious tang of the leaves filled the cabin. Dura was aware of Hork bending over his console, evidently shutting out the scents; as for herself - well, she could all but taste the protons dripping out onto her tongue.

The pigs could barely stand it. Their hexagonal arrays of eyecups bulged and their mouths gaped wide. With grunts of protest they hurled themselves against the unyielding harness towards the leaves, their jetfarts exploding in the cramped atmosphere of the cabin.

Under the steady pressure of the jetfart stream, the broad blades of the turbine began to turn. Soon the sweet, musky smell of pig-fart permeated the Air of the cabin, reminding Dura, if she closed her eyes, of the scents of her childhood, of the Net with its enclosed herd. She scattered a few fragments of food into the grasp of the pigs' gaping maws. Just enough to keep them fed, but little enough to keep them interested in more.

The anatomy of a healthy Air-pig was efficient enough to enable it to generate farts for many days on very little food. Pigs could travel metres allowing as much of their bulky substance to dissolve into fart energy as was required; these five, though terrified and frustrated by the conditions into which they had been penned, should have little problem powering the turbine for as long as the humans needed. And there was a back-up system - a stove powered by nuclear-burning wood - if they were desperate enough to need to risk its heat in the confines of the cabin.

Hork, grunting to himself, experimentally threw switches. The ship shuddered in response, and Hork peered out of the window, gauging the effect of the currents generated in the superconducting hoops.

Farr's face suddenly appeared outside the ship, at the window opposite Dura. His expression was solemn, empty. He was Waving hard, she realized; they must be descending rapidly already, and soon he and the other Wavers would not be able to keep up.

Farr must have given Adda the slip. And so, after all, here was a last goodbye. She forced herself to smile at Farr and raised her hand.

There was a thud from the hull of the 'Flying Pig'; the little craft shuddered in the Air before settling again.

Dura frowned. 'What was that?'

Hork looked up, his wide face bland. 'The Harbour cable cutting loose. Right on schedule.' He glanced out of the window at the dark shadows of

the superconducting hoops. ‘We’re falling under our own power now; the currents in the hoops are Waving us deeper into the Star. And the hoops are the only way we’re going to get back home ... We’re alone,’ he said. ‘But we’re on our way.’

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20

T*hree metres deep.*

It was a depth Dura couldn't comprehend. Humans were confined within the Mantle to a shell of superfluid Air only a few metres thick. Her first journey with Toba to the Pole from the upflux - so far that she had felt she was travelling around the curvature of the Star itself - had only been about thirty metres.

Now she was drilling whole metres into the unforgiving bulk of the Star itself. She imagined the Star crushing their tiny wooden boat and spitting them out, like a tiny infestation. And it was small comfort to remember that their journey would be broken before reaching such a depth only if they achieved their goal ... if the unimaginable really did, after all, emerge from the Core to greet them.

By the end of the second day they were already well below the nebulous boundary of the habitable layer of Air. The yellow brightness of the Air outside the windows had faded - to amber, then a deeper orange, and finally to a blood-purple colour reminiscent of the Quantum Sea. Dura pressed her face against cold clearwood, hoping to see something - anything: exotic animals, unknown, inhuman people, some kind of structure inside the Star. But there was only the muddy purple of the thickening Air, and her own distorted, indistinct reflection in the wood-lamps' green light. She was trapped in here - with her fears, and with Hork. She had expected to feel small, vulnerable inside this tiny wooden box as it burrowed its way into the immense guts of the Star; but the thick darkness beyond the window made her claustrophobic, trapped. She retreated into herself. She tended the fretting pigs, slept as much as she could, and kept her eyes averted from Hork's.

His determined efforts to talk to her, on the third day, were an intrusion.

'You're pensive.' His tone was offensively bright. 'I hope this adventure isn't causing you any - ah - philosophic difficulties.'

He'd left his console and had drifted up the cabin, close to her station near the pigs' harness. She stared at the broad, fat-laden face, the mound of beard around his mouth. When she'd first been introduced to Hork she'd been fascinated and disconcerted - as Hork intended, no doubt - by that beard, by this man with hair *on his face*. But now, as she looked closer, she

could see the way the roots of the beard's hair-tubes were arranged in a neat hexagonal pattern over Hork's chin ... The beard had been transplanted, either from Hork's own scalp or from one of his more unfortunate subjects.

So the beard wasn't impressive, she decided. Just decadent. And besides, it was yellowing more quickly than the hair on his head; another few years and Hork would look truly absurd.

How huge, how intrusive, how *irritating* he was. The tension between them seemed to crackle like electron gas.

'Philosophic difficulties? I'm not superstitious.'

'I didn't suggest you were.'

'We aren't religious about the Xeelee. I don't fear that we're going to bring down the wrath of the Xeelee, if that's what you mean. But Human Beings - alone - would never have attempted this journey into the Star.'

'Because the Xeelee will look after you, like mama in the sky.'

Dura sighed. 'Not at all. In fact, quite the opposite ... We have to accept the actions of the Xeelee without question - for we believe that their goals will prove in the long term to be of benefit to us all, to humans as a race. Even if it means the destruction of the Star - even if it means our own destruction.'

Hork shook his head. 'You upfluxers are full of laughs, aren't you? Well, it's a chilly faith. And damn cold comfort.'

'You don't understand,' Dura said. 'It's not meant to be comforting. Back up there ...' - she jerked her thumb upward, to the world of light and humans - '*there is* my comfort. My family and people.'

Hork studied her. His face, under its layers of fat, was broad and coarsely worked, but - she admitted grudgingly - not without perception and sensitivity. 'You fear death, Dura, despite your knowledge.'

Dura laughed and closed her eyes. 'I told you; knowledge is not necessarily a comfort. I've no reason not to fear death ... and, yes, I fear it now.'

Hork breathed deeply. 'Then have faith in me. We'll survive. I feel it. I know it ...'

His face was close to hers, so close she could smell sweet bread on his breath. His expression was clear, set. Determination seemed to shine from, him; just for a moment Dura felt tempted to let herself wallow in that

determination, to relax in his massive strength as if he were her father reborn.

But she resisted. She said harshly, ‘So you’ve no fear of death? Will your power in Parz help you overcome the final disaster?’

‘Of course it won’t,’ he said. ‘And I’m not without fear. That surprises you, doesn’t it? I’m not a fool without the imagination to be afraid, upfluxer; nor am I so arrogant as to suppose myself beyond the reach of death. I know that in the end I am as weak as the next man in the face of the great forces of the Star - let alone the unknowns beyond it. But, just at this moment, I’m ...’ He waved a hand in the Air. ‘I’m *exhilarated*. I’m doing something more than waiting for the next Glitch to hit Parz, or coping with the devastation of the last one. I’m trying to *change the world*, to challenge the way things are.’ His eyecups were dark wells. ‘And I couldn’t bear to allow anyone else to go into the dark at the heart of the Star, and not be there.’ He looked at her. ‘Can you understand that?’

‘Some say you’re running away from the real problems. That genuine courage would lie in staying behind and wrestling with the disaster, not flying off on a spectacular, wasteful jaunt.’

He nodded, his smile grim. ‘I know. Muub’s among them. Oh, don’t worry; I won’t do anything about it. It’s a point of view. Even one I share, in my darkest moments.’ He grinned. ‘But I like to think my father would have been proud of me, if he could have seen me now. He always thought I was so - *practical*. So unimaginative. And yet ...’

There was a thud from the hull of the ‘Flying Pig’; the little craft shuddered in the Air. The pigs squealed, thrashing in their stall, and with a single, involuntary movement Dura and Hork grabbed at each other.

The craft settled. Hork’s expansive belly, liquid beneath its covering of glittering material, was heavy against Dura’s stomach and breasts.

‘What was that?’

The small, regular arrays of hair at the fringe of his beard wafted as he breathed. ‘Corestuff bergs,’ he said, his voice tight. ‘That’s all. Corestuff bergs. If either of us was a Fisherman we’d not have been startled - that’s why they come down here in the first place: to fish for the Corestuff bergs. The “Pig” is designed to cope with little impacts like that; there’s nothing to fear.’ His arms were still around her - and her arms were in turn wrapped around his torso, her hands clutching at the layers of material over his back

- and now he reached up to stroke her hair. She wanted, suddenly, to bury herself in this bulky strength, to hide deep inside the warm darkness of the eyecups which were huge before her.

She scrabbled at his clothing, found a line of buttons down the seam at his side; and she felt his thick, clumsy fingers travelling over her own coverall.

A last shred of rationality made her assess his expression, his open mouth and flaring, shining nostrils, and she saw that his need was as great as hers.

His clothing came apart, and she peeled a layer of thick, expensive material away from his belly and chest. She ran her left hand down the curve of his stomach and found his cache; with a deft, tender motion she pulled out the small penis, wrapped it in her fingers and squeezed it gently. It swelled rapidly, pushing at her palm like a small animal. He'd opened her coverall now, and she shrugged out of it, kicking her legs impatiently out of the clinging material and letting the garment drift away into the Air. She felt Hork's hand slide, dry and hot, up her thigh and between her legs; she opened her thighs softly and he ran his fingers over her cleft, as clumsily and eagerly as an adolescent. There was a coolness inside her, and she knew that she was ready, that membranes inside her were already sighing lubricating Air into her. Now she took Hork's penis - it was pulsing, rhythmically - and pushed it deep inside her; it entered her easily. He sighed, and buried his face in her shoulder; she turned her head, resting her cheek on his hair. His penis was like a warm, beating heart inside her. His legs, still clothed, were warm and rough against hers as she began to scissor her thighs, back and forth, letting the pattern of her movements stimulate the muscle walls inside her.

At last she felt herself clench at him, hard; she shuddered, and she heard him gasp, his bulk heavy against hers as they drifted in the Air. Her muscles pulsed around him, and for a few seconds she felt flutters, beats, as the rhythms of their bodies strove to merge. But soon they coalesced, and she felt a surge of triumph as the walls of her vagina throbbed in unison with Hork.

He came quickly, and she only heartbeats later. They cried out and shuddered against each other; she felt the muscles of his back move under her fingers.

Hork slumped against her. She held him against her body, curling her fingers in his hair, unwilling to release his warmth and mass. She felt his penis still inside her, small and hot. The moment of closeness stretched on, and she thought of how strange this liaison would have seemed to her - deep in the lethal depths of the Star with the ruler of an astonishing City - if she could have imagined it, in the days before she left the upflux. For some reason she thought of Deni Maxx, the brisk doctor from Muub's Hospital. *But your coupling would have seemed much stranger to a watching Ur-human,* Dura imagined her saying. *We believe their sexual mechanism was based - not on compression, like ours - but on frictional forces. That's obviously impossible for us, embedded in superfluid as we are, so when they designed us . . .*

Slowly the closeness faded. The sounds of the craft - the snuffling of the feeding Air-pigs, the soft whirr of the turbine axle, the slow hissing of the wood-lamps - seeped back into her awareness. Hork's bulk seemed separate from her once more, and she became aware of folds of cloth trapped uncomfortably between their bodies, of a stiffness in her back as her body leaned forward over his belly.

Gently she pushed him away. His penis fell out of her with a soft, warm sound.

He looked into her eyes, smiled - he looked as if he had been *crying*, she thought briefly, startled - and tucked his penis back into its cache. He hauled his coverall around the circumference of his stomach, and she reached for her discarded clothes.

'Well,' she said at last. 'Where did that come from?'

He drifted away from her and settled back into the small seat close to the control console; she saw how his sparkling coverall was noticeably less elegant now, crumpled and sitting askew on his shoulders. 'Fear,' he said simply. His composure was restored, she saw, but he wasn't bothering to restore his usual abrasive front. The atmosphere between them had changed; the tension which had pervaded the ship in the days since its launch had dissipated. 'Fear. Obviously. I needed - comfort. I needed to lose myself. I don't know if that's enough of a reason; I'm sorry.'

'Don't be.' Absently she reached up and fed more leaf fragments into the pigs' hopper. 'I wanted it too.'

He ran his hands over the simple instruments before him. ‘I meant what I said, you know. For myself, I’d rather be here, running this ship, than anywhere in the Star. In Parz, the problems I have to deal with, day to day ...’ For a brief, empathetic moment she could imagine how it must be to be in a position like Hork’s - with the welfare of not just himself, not just his family, but of *thousands* resting on his shoulders. She watched the set of his face and recalled the hint of weeping she thought she’d detected; briefly she felt she understood him. He said, ‘Nothing ever gets solved, you see. That’s the trouble. Or if it does, the next day it is worse. At least here ...’ He grasped the simple controls. ‘At least here, I am doing something. Going somewhere!’

‘Yes, but doing what? Going where?’

He looked up at her. ‘You know there’s no reply to that. We’re seeking help, from whatever came out of the Core once before to destroy us.’

‘And how are we supposed to find it?’

‘You sound like the Finance sub-Committee,’ he said sourly. ‘All we can do is put ourselves into a position where *they* can find *us* . . . whoever *they* are.’

She felt her mood swinging away from him now; she felt hot and vaguely soiled, and once more the tight curves of the walls seemed to close in around her. She recalled, now, that they hadn’t kissed once. She didn’t even *like* this man. ‘So you’re happy to be going somewhere. Anywhere. Is that what this is really all about? - providing you with recreation from your awful burdens? And if it is, did you really have to drag me down into the depths with you?’

For a moment there was an element of hurt in his face, and his lips parted as if he were about to protest; but then he smiled, and she saw his defensive front enclose him once more. ‘Now, now. Let’s not bicker. We don’t want to be found at odds when our host from the Core comes to meet us, do we?’

‘I don’t think I can restrain myself for such a long wait,’ she said with contempt, and she turned back to her pigs, stroking and soothing them.

There was another thud at the hull, a scrape along the length of the ship. This one was softer than before, but still Dura found herself shuddering. She calmed the nervous pigs with quiet words, and wondered if she had been right - if it really would be such a long wait, after all.

Electron gas crackling from its superconducting hoops, the tiny wooden ship laboured centimetre after centimetre into the thickening depths of the neutron star.

Bzya was to be put on double shifts, inside the Bells. He didn't know when he would next have enough free time to get away from the Harbour between dives. So he invited Adda and Farr to come see him off, in a place he called a 'bar'.

Adda found the place with some difficulty. The bar was a small, cramped chamber tucked deep inside the Downside. The only light came from guttering wood-lamps on the walls; in the green, poky gloom Adda was strongly aware of how deep inside the carcass of the City he was buried.

In one corner of the bar was a counter where a couple of people were apparently serving something, some kind of food. Rails criss-crossed the chamber with no apparent pattern; men and women clustered together in small groups on the rails, slowly eating their way through bowls of what looked like bread, and talking desultorily. Adda saw heavy workers' tunics, scarred flesh, thick, twisted limbs. One or two appraising stares were directed at the upfluxer.

Bzya was alone at a length of rail, close to the far wall. He saw Adda and raised an arm, beckoning him over; three small bowls were fixed to the rail beside him.

Adda pushed forward, feeling self-conscious in his bandages, and clambered stiffly through the crowded place, aware of the babble of conversation all around him.

'Adda.' Bzya smiled through his distorted face, and waved Adda to a clear space of rail. Adda hooked one arm over the rail, hooking himself comfortably into place. 'Thanks for coming down.' Bzya glanced, once, past Adda towards the door, then turned back to his bowls.

Adda caught the look. 'No Farr,' he said heavily. 'I'm sorry, Bzya. I couldn't find him.'

Bzya nodded. 'I expect he's Surfing again.'

'I know you did a lot for him, when he was working in the Harbour; he should have ...'

Bzya held up his thick palm. 'Forget it. Look, if I was his age I'd rather be losing myself in the sky with the Surfers than sitting in a poky place like

this with two battered old fogeys. And with the Games coming up in a couple of days, they'll only have one thing on their minds. Or maybe two,' he said slyly. He nodded at the three bowls on the rail. 'Anyway, it just means there's more of this stuff for us.'

Adda looked down at the row of bowls. They were crudely carved of wood and were little larger than his cupped palm, and they were fixed to the rail by stubs of wood. The bowls contained small slices of what might have been bread. Adda, cautiously, pulled out a small, round slice; it was dense, warm and moist to the touch. He turned it over doubtfully. 'What the hell's this?'

Bzya laughed, looking pleased with himself. 'I didn't think you'd have heard of it yet. No bars in the upflux, eh, my friend?'

Adda glared. 'I'm supposed to eat this stuff?'

Bzya extended his fingers, inviting Adda to do so.

Adda sniffed at the plastic stuff, squeezed it, and finally took a small nibble. It was as hot, dense and soggy as it looked - unpleasant inside the mouth - and the taste was sour, unidentifiable. Adda swallowed the fragment. 'Disgusting.'

'But you've got to treat it right.' Bzya dipped into the bowl, drew out a thick handful of the stuff, and crammed it into his mouth. His big jaws worked as he chewed the stuff twice, then swallowed it down in one go. He closed his eyes as the hot food passed down his throat; and after a few seconds he shuddered briefly, suppressing a sigh. Then he belched. '*That's* how you take beercake.'

'Beercake?'

'Try it again.'

Adda reached into the second bowl and lifted a healthy handful of cake to his mouth. It sat in his mouth, hot, dense and eminently indigestible; but, with determination; he bit into it a couple of times and then swallowed, forcing his throat to accept the incompressible stuff. The cake passed down his throat, a hard, painful lump. 'Fabulous,' he said when it was gone. 'I'm so glad I came.'

Bzya grinned and held up his palm.

... And a heat seemed to surge smoothly out from Adda's stomach, flooding his body and head; his palms and feet tingled, as if being worked by invisible fingers, and his skull seemed to swell in size, filling up with a

roomy, comfortable warmth. He looked down at his body, astonished, half-expecting to see electron gas sparking around his fingertips, to hear his skin sighing with the new warmth. But there was no outward change.

After a few seconds the heat-surge wore away, but when it had receded it left Adda feeling subtly altered. The bar seemed cosier - friendlier - than even a moment before, and the smell of the remaining beercake was pleasing, harmonious, enticing.

‘Welcome to beercake, my friend, and a new lifelong relationship.’

The pleasing warmth induced by the cake still permeated Adda. He poked at the cake with a new wonder. ‘Well, I’ve not eaten anything with such an impact before, up- or downflux.’

‘I didn’t think so.’ Bzya picked up a piece of cake and compressed it between his fingers. ‘Farr is developing a taste too, I ought to say. It’s a mash, mostly of Crust-tree leaf. But it’s fermented - in huge Corestuff vessels, for days ...’

‘Fermented?’

‘Spin-spider web is put into the vats with the mash. There’s something in the webbing, maybe in the glistening stuff that makes it sticky, which reacts with the mash and changes it to beercake. Magic.’

‘Sure.’ Adda took another mouthful of the beercake now; it was as revolting as before, but the anticipation of its after-effects made the taste much easier to bear. He swallowed it down and allowed the warmth to filter through his being.

‘What does the stuff cost?’

‘Nothing.’ Bzya shrugged. ‘The Harbour authorities provide it for us. As much as we want, as long as we’re able to do our jobs.’

‘What do you mean? Is it bad for you?’

‘If you overdo it, yes.’ Bzya rubbed his face. ‘It works on the capillaries in your flesh - dilates them - and some of the major pneumatic vessels in the brain. The flow of Air is subtly altered, you see, and ...’

‘And you feel wonderful.’

‘Yeah. But if you use it too often, you can’t recover. The capillaries stay dilated ...’

Adda gazed around the bar, at this safe, marvellous place. ‘That seems all right to me.’

‘Sure. Your head would be a wonderful place to live in. But you couldn’t function, Adda; you couldn’t do a job. And if it gets bad enough you couldn’t even feed yourself, without prompting. But, yes, you’d feel wonderful about it.’

‘And I don’t suppose this City is so forgiving of people who can’t hold down jobs.’

‘Not much.’

‘Don’t the Harbour managers worry they’re going to lose too many of their Fishermen, to this cake stuff? Why dole it out free?’

Bzya shrugged. ‘They lose a few. But they don’t care. Adda, we’re expendable. It doesn’t take long to train up a new Fisherman, and there’re always plenty of recruits, in the Downside. And they know the cake keeps us here in the bars, happy, quiet, and available. They gain more than they lose.’ He chomped another mouthful. ‘And so do I.’

Adda worked his way slowly through the bowl, cautiously observing the cake’s increasing effects on him. Every so often he moved his fingers and feet, testing his coordination. If he got to the point where he even thought he might be losing control, he promised himself, he’d stop.

The Fisherman had fallen silent; his huge fingers toyed with the cake.

‘I hear you’re on double shifts. Whatever that means.’

Bzya smiled, indulgent. ‘It means I’m assigned to the Bells twice as frequently as usual. It’s because they’re running twice as many dives as usual.’

‘Why?’

‘The upflux Glitch. No wood coming into the City. Not enough, anyway. People bitch about food rationing, but the wood shortage is just as important in the longer term. And let’s hope the day never comes when they have to ration beercake ... Anyway, they want more Corestuff metal, to use as building material. ’

‘Building? Are they extending the City?’

‘Rebuilding. It goes on all the time, Adda, mostly deep in the guts of the place. Small repairs, maintenance. Although,’ he said, leaning forward conspiratorially, ‘there are rumours that it isn’t just the need to keep up routine repairs that’s prompted this increased demand.’

‘What, then?’

‘They’re trying to strengthen the City’s structure. Rebuild the skeleton with more Corestuff. They’re not shouting about it for fear of causing panic; but they’re endeavouring to make it more robust in the face of future problems. Like a closer Glitch.’

Adda frowned. ‘Can they do that? Will it work?’

‘I’m not an engineer. I don’t know.’ Bzya chewed on the cake, absently. ‘But I doubt it,’ he said without emotion. ‘The City’s so huge; you’d have to rip most of its guts out to strengthen it significantly. And it’s a ramshackle structure. I mean, it *grew;* it was never planned. It was built for space, not strength.’

Parz had been one of the first permanent settlements founded after humanity was scattered through the Mantle following the Core Wars. At first Parz was a random construct of ropes and wood, no more significant than a dozen others, drifting freely above the Pole. But at the Pole the bodies of men and women were significantly stronger, and so Parz grew rapidly; and its position at the only geographically unique point in the southern hemisphere of the Mantle gave it strategic and psychological significance. Soon it had become a trading centre, and had wealth enough to afford a ruling class - the first in the Mantle since the Wars. The Committee had been founded, and the growth and unification of Parz had proceeded apace.

Parz’s wealth exploded when the Harbour was established - Parz was the first and only community in the Mantle able to extract and exploit the valuable Corestuff. Soon the scattered community of the cap of Mantle around Parz, the region eventually to be called the hinterland, fell under Parz’s economic influence. Eventually the hinterland and City worked as a single economic unit, with the raw materials and taxes of the hinterland flowing into Parz, with Corestuff and - more importantly - the stability and regulation provided by Parz’s law washing back in return. Eventually only the far upflux, bleak and inhospitable, remained disunited from Parz, home to a few tribes of hunters, and bands of Parz exiles like the Human Beings themselves.

Adda bit into more cake. ‘I’m surprised people accepted being taken over like that. Didn’t anybody fight?’

Bzya shook his head. ‘It wasn’t seen as a conquest. Parz is not an empire, although it might seem that way to you. Adda, people remembered

the time before the Wars, when humans lived in safety and security throughout the Mantle. We couldn't return to those times; we'd lost too much. But Parz was better than nothing: it offered stability, regulation, a framework to live in. People gripe about their tithes - and nobody's going to pretend that the Committee get it right all the time - but most of us would prefer taxes to living wild. With all respect to you, my friend.' He bit into his cake. 'And that's still true today; as true as it ever was.'

Two of the bowls were already empty. Adda felt the seduction of this place, that he could have sat here in this companionable glow with Bzya for a long time. 'Do you really believe that? Look at your own position, Fisherman; look at the dangers you face daily. Is this really the best of all possible lives for you?'

Bzya grinned. 'Well, I'd exchange places with Hork any day, if I thought I could do his job. Of course I would. And there are plenty of people closer to me, in the Harbour, who I'd happily throttle, if I thought it would make the world a better place. If I didn't think they'd just bring in somebody worse. I accept I'm at the bottom of the heap, here, Adda. Or close to it. But I believe it's the way of things. I will fight injustice and inequity - but I accept the need for the existence of the heap itself.' He looked carefully at Adda. 'Does that make sense?'

Adda thought it over. 'No,' he said at last. 'But it doesn't seem to matter much.'

Bzya laughed. 'Now you see why they give us this stuff for free. Here.' He held out the third bowl. 'Your good health, my friend.'

Adda reached for the cake.

A couple of days later Bzya's shifts should have allowed him another break. Adda searched for Farr, but couldn't find him, so he went down to the bar alone. He entered, awkward and self-conscious in his dressings, peering into the gloomier corners.

He couldn't find Bzya, and he didn't stay.

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21

In the interior of the Star there were no sharp boundaries, merely gradual changes in the dominant form of matter as pressures and densities increased. So there was no dramatic plunge, no great impacts as the ‘Flying Pig’ hauled itself deeper: just a slow, depressing diminution of the last vestiges of Air-light. And the glow cast by the wood-lamps fixed to the walls was no substitute; with its smoky greenness and long, flickering shadows, the gloom in the cabin was quite sinister.

To Dura, hunched over herself in her corner of the ship, this long, slow descent into darkness was like a lingering death.

Soon, though, the ride became much less even. The ship swayed alarmingly and at one point was nearly upended. The labouring pigs, their shadows huge on the ship’s roof, bleated pathetically; Hork laughed, his eyecups pools of green darkness.

Dura’s fingers scrabbled over the smooth wooden walls in search of purchase. ‘What’s happening? Why are we being pummelled like this?’

‘Every Bell hits underMantle currents. The only difference is, we’ve no Spine to steady us.’ Hork spoke to her slowly, as if she were stupid. Since their single physical encounter, his aloof hostility had been marked. ‘The substance of the Mantle at these depths is different from our Air . . . or so my tutors used to tell me. It’s still a superfluid of neutrons, apparently, but of a different mode from the Air: it’s *anisotropic* - it has different properties in different directions.’

Dura frowned. ‘So in some directions it’s like the Air, and it doesn’t impede our progress. But in others ...’

‘ . . . it feels thick and viscous, and it batters against our magnetic shield. Yes.’

‘But how can you tell which directions it’s Air-like?’

‘You can’t.’ Hork grinned. That’s the fun of it.’

‘But that’s dangerous,’ she said, uneasily aware of how childlike she sounded.

‘Of course it is. That’s why the Harbour suffers so many losses.’

... *And this is where I sent my brother,* she thought with a shiver. She felt strangely, retrospectively fearful. Here, drifting through this anisotropic nightmare, it was as if she were fearing for her brother for the first time.

Still, after a while Dura found she could ignore - almost - the constant, uneven buffeting. Immersed in the hot, fetid atmosphere of the ship, with the warm stink of the pig-farts and the patient, silent work of Hork at his control box, she was even able to doze.

Something slammed into the side of the ship.

Dura screamed and jolted fully awake. She felt herself quiver from the blow, as if someone had punched her own skull; she looked around, wild-eyed, for the source of the disaster. The pigs were squealing furiously. Hork, still at his controls, was laughing at her.

‘Damn you. What was that?’

He spread his hands. ‘Just a little welcoming card from the Quantum Sea.’ He pointed. ‘Look out of the window.’

She turned to stare through the clearwood. The Mantle here was utterly dark, but the lamps of the ship cast a green glow for a few microns through the murky, turbulent stuff. And there were forms drifting through that dim ocean - blocky, irregular shapes, many of them islands large enough to swallow up this tiny craft. The blocks slid silently upwards past the ship and towards the distant Mantle - or rather, Dura realized, the ‘Pig’ herself was hurtling down past them on her way towards the Core.

‘Corestuff bergs ... Islands of hyperonic matter,’ Hork said. ‘No Fisherman would tackle bergs of such a size . . . but then, no Fisherman has ever been so deep.’

Dura stared gloomily out at the vast, slow-moving bulks of hyperonic matter. If they were unlucky enough, she realized - if they were caught by a combination of a large enough mass and an adverse current - their little ship would be crushed like a child’s skull, magnetic protection or no. ‘How deep are we?’

Hork peered at the crude meters on his control panel; his beard scratched softly at the meters’ clearwood covers. ‘Hard to say,’ he said dismissively. ‘Our tame experts were very clever at finding ways for us to travel so far, but not so clever at letting us know where we are. But I’d guess . . .’ He scowled. ‘Perhaps five metres below the City.’

Dura gasped. *Five metres* . . . Five hundred thousand mansheights. Why, surely even an Ur-human would be awed by such a journey.

‘Of course, we’ve no real control over our position. All we’ve the capability to do is to descend and, if we live through that, to come up again.

But we could emerge anywhere; we've no idea where these currents are taking us.'

'We've discussed this problem. Wherever we emerge we need only follow the Magfield to the South Pole.'

Hork smiled at her. 'But that could be tens of metres from the City . . . It could take months to return. And then we will rely on your upfluxer survival skills to enable us to endure, in the remote wilds of the Star. I will place myself in your hands, and I anticipate that the journey home will be . . . interesting.'

The impacts from the hyperonic bergs were coming thick and fast now. Hork pulled at the wooden levers on his control panel and slowed their progress down to a crawl; Dura watched through the windows as the thickening masses of Corestuff clustered around the 'Pig', held back from crushing her only by the invisible walls of the magnetic shield.

At last Hork flicked over his controls and pushed himself away from the panel. 'You may as well let the animals rest,' he said to Dura. 'That's as far as we're going.'

Dura frowned and peered out of the windows. 'We can't penetrate any deeper?'

Hork shrugged, and yawned elaborately. 'Not unless a channel through the bergs opens up. The bergs are like a solid mass from here on in - you can see for yourself. No, this is the end of the journey.' He drifted up through the cabin, took some fragments of untouched leaf matter from the pigs' trough and chewed it without enthusiasm. He handed more handfuls of food to Dura. 'Here,' he said.

Dura took the food and bit into it thoughtfully. The whine of the turbine was stilled now, and she was suspended in a silence broken only by the hoarse wheezing of the pigs and by the soft thumping of hyperonic fragments against the magnetic shield. The pigs, still bound into their harnesses, were trembling with the panic of their blocked flight; their sixfold eyes rolled. As she ate, Dura ran her hands over the dilated pores of their flanks; the simple action of soothing the frightened animals - of tending creatures even more scared than herself - seemed to calm her.

Hork folded his arms, his massive shoulder muscles bunching under his glittering costume. 'Well, this is the strangest picnic I've ever had.'

'What do we do now?'

‘Who knows?’ He grinned at her, a fragment of his professional charm showing. ‘Maybe that’s all we’ve come so far to find.’ He pointed out of the window. ‘Corestuff. Hard, dangerous, and dead. Anyway, it’s not over yet. We’ve only just arrived, after all. We can stay here for days, if we have to.’

Dura laughed. ‘Maybe you should go out and make a speech. Wake the Colonists out of their thousand-year slumber.’

Hork studied her impassively, his heavy jaw working; then he turned away from her, rebuffing her completely.

She felt alone and a little foolish. In the renewed silence of the cabin, her fear crowded in once more. She stroked the quivering pigs and sucked on leaf-matter.

She wondered how long they would have to wait here, before Hork would give up - or, terrifyingly, before *something happened.*

In the end, they didn’t have to wait very long at all.

Hork screamed, his voice thin and high with terror.

Somehow Dura had fallen asleep again. She jolted awake, the muggy Air thick in her lungs and eyes. She looked around quickly.

The green glow of the lamps filled the cabin with eerie, sharp shadows. The pigs were squealing, terrified, arching in their restraints. Hork, all his arrogance and cockiness gone, had backed against a wall, his coverall rumpled and stained, his hands fruitlessly seeking a weapon. It was as if the inhabitants of the ‘Flying Pig’, human and animal alike, had radiated away from the heart of the cylindrical craft, like fragments of a slow explosion. Dura blinked, trying to clear her vision. No, not an explosion, she saw; hovering at the geometric centre of the cylinder - the focus of all this terror - was *another person*. A third human, here where it was impossible for any human to be . . .

Or rather, she realized as she stared more closely, it was - something - with the form of a human. She saw a bulky woman, evidently older than herself, dressed in what might have been a Fisherman’s tunic. But the material glowed, softly crimson, and it looked seamless. Hair, deep black, was tied tightly around her scalp. A purple glow shone out of eyecups, nostrils and mouth.

. . . But there was something in those eyecups, she saw. There was *flesh* in there, spheres which moved independently of the face, like animals trapped inside the skull.

She felt the leaves rise in her throat; she wanted to scream, scrabble at the walls of the craft to escape this. She held herself as still as she could, forcing herself to study the vision.

‘It’s like a woman,’ she whispered to Hork. ‘A human. But that’s impossible. How could a human survive down here? There’s no Air to breathe, or ...’

Hork sounded impatient, though his breath still rattled with fear. ‘This isn’t a human, obviously. It’s ... something else, using the form of a human. A human-shaped sac of fire.’

‘*What* else? What is it?’

‘How am I supposed to know?’

‘Do you think it’s Xeelee?’

‘No human has ever seen a Xeelee. Anyway, the Xeelee are just legend.’

Astonishingly, she found anger building inside her. At a time like this, she felt *patronized*. She glared at him and hissed, ‘Legends are why you brought me here, remember?’

The Chair of Parz City shot an exasperated glance at her; then he turned to face the woman-thing, and when he spoke Dura found herself admiring the steadiness of his tone. ‘You,’ he challenged. ‘Intruder. What do you want with us?’

The silence, broken by the wheezing of the pigs, seemed to stretch; Dura, staring at the ugly flaps of flesh which covered the woman-thing’s ear-cavities, wondered if it could hear Hork, still less answer him.

Then the woman-thing opened its mouth. Light poured out of its straining lips, and a sound emerged - deeper than any voice originating in a human chest - and, at first, formless.

But, Dura realized, wondering, words were beginning to emerge.

I . . . We’ve been expecting you. You took your own sweet time. And we had a devil of a job to find you. It looked around at the ‘Pig’, its neck swivelling like a ball joint, unnaturally. *Is this the best you could do? We need you to come a lot deeper than this; transmission conditions are awful . . .*

Hork exchanged an astounded glance with Dura.

‘Can you understand me?’ he asked the thing. ‘Are you a Colonist?’

‘Of course it can understand you, Hork,’ Dura hissed, exasperated in her turn. She felt fascinated beyond her horror of this bag of skin. ‘How is it you can speak our language?’

The thing’s mouth worked, obscenely reminiscent of an Air-pig’s, and the flesh-balls in the eyecups rolled; as she watched, it seemed to Dura that the woman-thing appeared less and less human. It was merely a puppet of some unfathomable hyperonic creature beyond the hull, she realized; she found herself glancing through the window, wondering what immense, dark eyecups might be fixed on her even now.

The woman-thing *smiled*. It was a ghastly parody.

Of course I can understand you. I’m a Colonist, as you call us . . . but I’m also your grandmother. Once or twice removed, anyway . . .

A week before Games Day, Muub, the Physician, sent Adda an invitation to join him to view the Games from the Committee Box, high over the Stadium. Adda felt patronized: he had no doubt that in Muub’s eyes he remained an unreconstructed savage from the upflux, and to Muub, Adda’s reactions to the City’s great events would be amusements - entertainments in themselves.

But he didn’t refuse immediately. Perhaps Farr would enjoy seeing the Games from such a privileged vantage point. Farr’s mood remained complex, difficult for Adda to break into. In fact he saw little of Farr these days; the boy seemed determined to spend as much time as possible with the rebellious, remote community of Surfers who lived half their lives clinging to the City’s Skin.

In the end, Farr wouldn’t come to the Games.

The City wasn’t what it was. Even in Adda’s short time of acquaintance with it, Parz, battered by the consequences of the Glitches, had lost some of its heart. In the great avenues half the shops and cafés were closed up now, and the ostentatiously rich with their trains of perfumed Air-piglets were conspicuous by their absence. There was a sense - not exactly of crisis - but of austerity. Times were difficult; there was much to be done and endured before things improved and the City could enjoy itself again.

But the Games were going to be different, it seemed. As the Day approached he sensed a quickening of the City’s pulse. There seemed to be more people on the streets, arguing and gambling over the outcome of the

various strangely named events. The Luge. The Slalom. The Pole-Divers . . . The Games would be like a holiday for the City, a relief from drudgery.

Adda was *curious.*

So, in the end, he decided to accept Muub's invitation.

The Stadium was a huge, clearwood-walled box fixed to one of the City's upper edges. The Committee Box was a balcony which hung over the Stadium itself from the City's upper surface, and to reach it Adda had to travel to the uppermost Upside, to the Garden surrounding the Palace itself. Feeling more out of place than ever in the opulent surroundings, he Waved past the miniature, sculpted Crust-trees, brandishing his begrimed bandaging like a weapon. He was subjected to scrutiny by three layers of contemptuous Guards before he reached the Box itself; he enjoyed insulting them as they searched his person.

At last he was ushered into the Box, a square platform twenty mansheights on a side, domed over by clearwood. Neat rows of cocoons filled the platform, bound loosely to the structure by soft threads. About half the cocoons were already full, Adda saw; courtiers and other grandees nestled in the soft leather of the cocoons like huge, glittering insect larvae.

Their talk was bright and loud, their laughter braying; there was a heavy, cloying scent of perfume.

Adda was escorted to the front row of the Box by a small, humble-looking woman in a drab tunic. Muub was already there. He rested in his cocoon with his long, thin arms folded calmly against his chest, and his bare scalp shone softly as he surveyed the Stadium below. He turned to greet Adda with a nod. With ill grace Adda let the woman servant help him into a spare cocoon; his legs remained stiff and his right shoulder barely mobile, so that, embarrassingly, he had to be levered into the cocoon as if he were a statue of wood. Another woman, smiling, approached him with a box of sweetmeats; Adda chased her away with a snarl.

Muub smiled at him indulgently. 'I'm glad you decided to come, Adda. I believe you will find the Day interesting.'

Adda nodded, trying to be gracious. After all, he had accepted Muub's invitation. But what was it about this man's manner that irritated him so? He nodded over his shoulder at the sparkling ranks of courtiers. 'That lot seem to agree with you.'

Muub regarded the courtiers with aloof disdain. ‘Games Day is a spectacle which does not fail to excite the unsophisticated,’ he said softly. ‘No matter how many times it is viewed. And besides, Hork is absent. As you know very well. And there is something of a vacuum of authority, among my more shallow colleagues, until the Chair’s return.’ He listened to the jabber of the courtiers for a moment, his large, fragile head cocked to one side. ‘You can hear it in their tone. They are like children in the absence of a parent.’ He sighed.

Adda grinned. ‘Well, he said, ‘it’s nice to know that your superciliousness isn’t restricted to upfluxers.’ He deliberately ignored Muub’s reaction; he leaned forward in his cocoon and stared through the clearwood wall below him.

He was perched at the upper rim of the City. Its wooden Skin swept away below him, huge, uneven, battered; the great Corestuff anchor-bands were arcs of silver-grey cutting across the sky. Far below the City the Pole was a mass of bruised purple. Vortex lines shimmered across the sky around the City, on their way to their own rotation pole around the curve of the Star ...

Adda stared at the vortex lines for a moment. Were they more tightly packed than usual? He tried to detect a drift through the Air, a presage of another Glitch. But he wasn’t in the open Air - he wasn’t able to smell the changes in the photons, to taste the Air’s disturbance - and he couldn’t be sure there was any change.

The Stadium was thronged with people who swarmed through the Air, hauling themselves over each other and along the ropes and rails strung across the great volume. Even through layers of clearwood, Adda could hear the excited buzz of the crowd; the sound seemed to come in waves of intensity, sparkling with fragments of individual voices - the cry of a baby, the hawking yells of vendors working the crowd. Sewage outlets sprayed streams of clear waste from the shell of the Stadium into the patient Air.

Away from the bulk of the City, aerobats Waved silkily through the Air in a prelude to the Games proper. They were young, lithe, nude, their skins dyed with strong primary colours; with ripples of their legs and arms they spiralled around the vortex lines and dived at each other, grabbing each other’s hands and whirling away on new paths. There must have been a

hundred of them, Adda estimated; their dance, chaotic yet obviously carefully choreographed, was like an explosion of young flesh in the Air.

He became aware that Muub was watching him; there was curiosity in the Physician's shallow eyecups. Adda let his jaw hang open, playing the goggling tourist. 'My word,' he said. 'What a lot of people.'

Muub threw his head back and laughed. 'All right, Adda. Perhaps I deserved that. But you can scarcely blame me for my fascination at your reaction to all this. Such scenes can scarcely have been imaginable to you, in your former life in the upflux.'

Adda gazed around, trying to take in the whole scene as a gestalt - the immense, human construct of the City itself, a thousand people gathered below for a single purpose, the scarcely believable opulence of the courtiers in the Box with their fine clothes and sweetmeats and servants, the aerobats flourishing their limbs through the Air in their huge dance. 'Yes, it's impressive, ' he said. He tried to find ways of expressing what he was feeling. 'More than impressive. Uplifting, in a way. When humans work together, we can challenge the Star itself. I suppose it's good to know that not everyone has to scratch a living out of the Air, barely subsisting as the Human Beings do. And yet ...'

And yet, why should there be *wealth* and *poverty*? The City was a marvellous construct, but it was dwarfed on the scale of the Star - and it was no bigger than an Ur-human's thumb, probably. But even within its tiny walls there were endless, rigid layers: the courtiers in their Box, walled off from the masses below; the Upside and Downside; and the invisible - yet very real - barriers between the two. Why should it be so? It was as if humans built such places as this with the sole purpose of finding ways to dominate each other.

Muub listened to Adda's clumsy expression of this. 'But it's inevitable,' he said, his face neutral. 'You have to have organization - hierarchy - if you are to run the complex, interlinking systems which sustain a society like the City with its hinterland. And only within such a society can man afford art, science, wisdom - even leisure of the most brutish sort, like these Games. And with hierarchies comes power.' He smiled at Adda, condescending once more. 'People aren't very noble, upfluxer. Look around you. Their darker side will find expression in any situation where they can best each other.'

Adda remembered times in the upflux, when he was young, and the world was less treacherous than it had become of late. He recalled hunting-parties of five or six men and women, utterly immersed in the silence of the Air, their senses open, thrilling to the environment around them. Completely aware and alive, as they worked together.

Muub was an observer, he realized. Believing he was above the rest of mankind, but in fact merely detached. Cold. The only way to live was to be yourself, in the world and in the company of others. The City was like a huge machine designed to stop its citizens doing just that - to alienate. No wonder the young people clambered out of the cargo ports and lived on the Skin, riding on the Air by wit and skill. Seeking *life.*

The light had changed. The rich yellow of the Air over the Pole seemed brighter. Puzzled, he turned his head towards the upflux.

There was a buzz of anticipation from the Box, answered by a buzz from the Stadium. Muub touched Adda's arm and pointed upwards. 'Look. The Surfers. Do you see them?'

The Surfers were a hexagonal array, shining motes scattered across the Air. Even Muub, despite his detachment, seemed thrilled as he stared up, evidently wondering how it would be to ride the flux so high, so far from the City.

But Adda was still troubled by the light change. He scoured the horizon, cursing the distortion of the clearwood wall before him.

Then he saw it.

Far upflux, far to the north, the vortex lines had disappeared.

Its - *her* - name was Karen Macrae. She had been born in a place called Mars, a thousand years ago.

That's Earth-standard years, she said. *Which are about half of Mars' years, of course. But they're the same as your years . . . We designed your body-clocks to match the standard human metabolic rate, you see, and we got you to count the rhythms of the neutron star so that we have a common language of days, weeks, years . . . We wanted you to live at the same rate as us, to be able to communicate with us*. Karen Macrae hesitated. *With them, I mean. With standard humans.*

Dura and Hork looked at each other. He hissed, 'How much of this do you understand?'

Dura stared at Karen Macrae. The floating image had drifted away from the centre of the cabin, now, and seemed to be growing coarser; it was not a single image, in fact, but a kind of mosaic formed by small, jostling cubes of coloured light. Dura asked, ‘Are you an Ur-human?’

Karen Macrae fizzed. *A what? Oh, you mean a standard human. No, I’m not. I was, though . . .*

Karen Macrae and five hundred others had come to the Star from - somewhere else. Mars, perhaps, Dura thought. They had established a camp outside the Star. When they’d arrived the Star had been empty of people; there were only the native lifeforms - the pigs, the rays, the spin-spiders and their webs, the Crust-trees.

Karen Macrae had come to populate the Star with people.

The structure of a neutron star is astonishingly rich, whispered Karen Macrae. *Do you realize that? I mean, the Core is like a huge, single nucleus - a hypernucleus, laced with twenty-four per cent hyperonic matter. And it’s fractal. Do you know what that means? It has structure on all scales, right down to the . . .*

‘Please.’ Hork held up his hands. ‘This is a storm of words, conveying - nothing.’

The blocks of Karen’s face jostled like small insects. *I am a first-generation Colonist*, she said. *We established a Virtual environment in the hypernucleus - in the Core. I was downloaded via a tap out of my corpus callosum - downloaded into the environment here, in the Core*. Karen Macrae brought veils of skin down over the pulpy, obscene things nestling in her eyecups. *Do you understand me?*

Hork said slowly, ‘You are - a copy. Of an Ur-human. Living in the Core.’

Dura said, ‘Where is the Ur-human Karen Macrae? Is she dead?’

She’s gone. The ship left, once we were established here. I don’t know where she is now

... Dura tried to detect emotion in the woman-thing’s voice - was she resentful of the original who had made her, who had thrust her into the Core of the Star? Was she envious? - but the quality of the voice was coarse, too harsh to tell; Dura was reminded of the Speaker system on Toba Mixxax’s Air-car.

The colony of human copies, downloaded into the Core, had devices which interfaced with the physical environment of the Star, the woman-thing told them. They had a system to produce something called exotic matter; they laced the Mantle with wormholes, linking Pole to Pole, and they built a string of beautiful cities.

When they'd finished, the Mantle was like a garden. Clean, empty. Waiting.

Dura sighed. 'Then you built us.'

'Yes,' Hork said. 'Just as our fractured history tells us. We are made things. Like toys.' He sounded angry, demeaned.

The world had been at peace. There had been no need to struggle to live. There were no Glitches (few, anyway). The downloaded Colonists, still residing in the Core, had been there for the Human Beings like immortal, omniscient parents.

One could Wave from upflux to Pole, through the wormhole transit ways, in a heartbeat.

Hork pushed forward, confronting the woman-thing. 'You expected us to come here, to seek you.'

We hoped you would come. We could not come to you.

'Why?' He seemed to be snarling now, Dura thought, unreasonably angry at this ancient, fascinating woman-shell. 'Why do you need us now?'

Karen Macrae turned her head. The light-boxes drifted, colliding noiselessly - no, Dura saw, they drifted through each other, as smoothly as if they were made of coloured Air.

The Glitches, she said slowly. *They are damaging the Core . . . they are damaging us.*

Dura frowned. 'Why don't you stop them?'

We haven't a physical interface any more. We withdrew it. Karen's voice was growing more indistinct, her component blocks larger; the form of a human was gradually being submerged in loss of detail.

Hork pushed himself forward from the cabin wall, his heavy hands outspread against the wood. 'Why? Why did you withdraw? You built us, and took away our tools, and abandoned us. You waged war against us; you took our treasures, our heritage. Why? *Why?'*

Karen turned to him, her mouth open, purple boxes streaming from her coarsely defined lips. She expanded and blurred, the boxes comprising her

image swelling.

Hork threw himself at the image. He entered it as if it were no more than Air. He batted at the drifting, crumbling light-boxes with his open palms. '*Why did you make us? What purpose did we serve for you here? Why did you abandon us?*'

The boxes exploded; Dura quailed from a monstrous, ballooning image of Karen Macrae's face, of the pale forms infesting her eyecups. There was a soundless concussion, a flood of purple light which filled the cabin before fleeing through the walls of the ship and into the ocean beyond. The human-thing, the simulacrum of Karen Macrae, was gone. Hork twisted in the Air, punching at emptiness in his frustration.

But there were new shadows in the cabin now, blue-green shadows cast by something behind Dura. Something outside the ship. She turned.

The object was a tetrahedron, she recognized immediately; a four-faced framework of glowing blue lines, like fragments of vortex lines. Sheets of gold, rippling, glistened over the faces. The construct was perhaps ten mansheights to a side, and its faces were easily wide enough to permit a ship the size of the 'Pig' to pass.

It was a gate. A four-sided gate ...

Dura felt like a child again; she found a smile, slow and heavy with wonder, spreading across her face. This was a wormhole Interface, the most precious of all the treasures lost in the Core.

It could be a gateway out of the Star.

She grabbed at Hork's tunic, wonder flooding out her fear. 'Don't you understand what it means? We'll be able to travel, to cross the Star in a moment, as we could before the Wars . . .'

He pushed her away roughly. 'Sure. I understand what this means. Karen Macrae can't stop the Glitches. And so - for the first time since dumping us in the Mantle all those years ago, since leaving us to our fate - she and her Core-infesting friends need us. We - you and I - are going to have to travel through that thing, to wherever it takes us, and *stop the Glitches ourselves*.'

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22

Cris Mixxax climbed onto his board. The wood under his bare feet was polished, warm, familiar; his soles gripped the ridged surface, and the ribs of Corestuff embedded in the wood felt like cold, hard bones. He flexed his knees experimentally. Electron gas hissed around his ankles and toes as the board cut through the flux lines. The Magfield felt springy, solid.

Cris grinned savagely. It felt *good*. It all felt good. At last this day had come, and it was going to be his.

The sky was a huge diorama, all around him. The South Pole, with its brooding purple heart sunk deep in the Quantum Sea, was almost directly below him; he could feel the massive Polar distortion of the Magfield permeating his body. Above him the Crust seemed close enough to touch, the dangling Crust-trees like shining hairs, immensely detailed; patterns of cultivation showed in rectangular patches of colour and texture - sharp, straight-line edges imposed by humans on the vibrant nature of the Star.

The City hovered in the Air over the Pole. Parz was so far below him he could cover it with the palm of his hand, and imagine he was alone in the sky - alone, save for his fellow racers. Parz looked like some elaborate wooden toy, surrounded by its cage of shining anchor-bands and pierced by a hundred orifices from which the green light of wood-lamps seeped, sickly. Sewage cascaded steadily from its underside, around the Spine of the Harbour. He could see the shining bulge that was the Stadium; it clung to the City’s upper lip like a fragile growth, with the Committee Box a colourful balcony over it. Somewhere in there his parents would be watching, he knew - praying for his success, he’d like to think. But perhaps they were wishing he might fail - give up this dream, this distraction of Surfing, and join them in their quiet, constrained lives once more.

He shook his head, staring down on the City as if he were some god, suspended over it. Out here the inwardness, the frustration of his life in and around the City, seemed remote, reduced to the trivial; he felt exalted, able to view it all with compassion, balance. His parents loved him, and they wanted what was best for him - as they saw it. The cries of the race marshals, tiny in the huge, glowing sky, floated to him. *Almost time*. He glanced around. There were a hundred Surfers, drawn into a rough line across the sky; now they were drawing precisely level, into line with the

squads of marshals in their distinctive red uniforms. Cris flicked at his own board, once, twice; he felt it kick at the Magfield and bring him exactly into his place in the line. He stared ahead. He was facing along the direction of the vortex lines, towards the rotation pole; the closest line was a few mansheights from him, and the lines swept around him like the walls of some intangible corridor, beckoning him to infinity.

The challenge of the race was to Surf along the vortex lines, far across the roof of the world - across the Pole - to a finishing cross-section; there another group of marshals marked out an area of the sky, like human spin-spiders. The race was won - not just by the fastest, the first to complete the course - but by whoever applied the most technical skill, the most style in following the course.

He looked along the line. Ray, he knew, was three places down from him - the only other of his friends to have qualified for the Games this year. There she was, her lithe, bare body coiled over her board, her hair swept back and her teeth shining in a broad, hungry grin. He caught her eye, and she raised a fist, her smile broadening.

The Surfers were all in place now; he saw how they settled over their boards, concentrating, spreading their feet and lifting their arms. The marshals continued to scurry around the line like worried little animals, checking positions, adjusting boards with small pushes and shoves. Silence spread along the line; the marshals were withdrawing. Cris felt his senses open up. The board under his feet, the fizz of the Magfield, the freshness of the Air so far from the womb of the City as it sighed through his mouth and capillaries - these were vital and real things, penetrating his head; he had never felt so *alive.*

And perhaps, a distant, unwelcome part of him said, he never would again.

Well, if that was to be so - if his life was to be a long-drawn-out anticlimax after this superb moment - then let it be; and let this be his finest time.

The marshals glanced along their line at each other. In unison they raised their right arms - and brought them down with a chop, a cry of ‘Begin!’

Cris thrust savagely at his board. He felt the Magfield surge through the board and his limbs, dragging at the currents of charged particles there. He

lunged forward with a roar, lancing through the Air. The tunnel of vortex lines seemed to explode outwards around him; blue-white electron gas sparkled over his body. He was half-aware of similar yells around him, from the rest of the line, but he shut out the other Surfers; he focused on his board, the Magfield, his balance and position in the Air.

The line of marshals, ragged and breaking up, hurtled beneath him.

He opened his mouth and yelled again, incoherent. In his peripheral vision he saw that only Ray, and one or two others, had matched his start. He was in the lead, already ahead of the other Surfers! And he knew his style was good, his balance right; the Magfield surged through his body like a wave of heat. He raised a hand before his face and watched electron gas shower from his fingertips; shrouded in blue light he must look like a figure from a dream racing across the sky ...

His board slammed upwards, into his feet.

He gasped, almost thrown off the board with the shock. It had been like hitting something solid in the Magfield. He let his knees bend, trying to absorb the upward surge; but still he was hurled up into the Air, balanced perilously on his board. The vortex lines slid down the sky around him, and the Magfield flux lines tore at his stomach and chest as he was dragged brutally across them.

He heard screams from the Surfers around him.

The surge passed. Shaken, his knees and ankles aching, he straightened up. He risked glances to left and right. The line of Surfers was ragged, scattered, broken up. Whatever had caused that surge had hit the others as hard as it had him.

. . . Ray had gone. He saw a glinting sparkle which might have been her board, turning end over end through the Air; but of the girl herself there was no sign.

He felt a stab of concern - an awful, unfamiliar sense of *waste* - but the feeling was drowned by a flood of triumph. By luck or skill, or both, he had survived. He was still on his board, still in the race, and still determined to win.

But there was still something wrong. He was drifting downwards through the hexagonal array of lines. He corrected his line of flight, pushed himself hard along the Magfield - but again there came that damnable drift

downwards. He felt confused, disoriented, as if his instincts were betraying him.

. . . No, he realized slowly; his instincts, his skill, were fine. He was holding his line. *The vortex lines themselves were drifting upwards, towards the Crust.*

He was a City boy, but he knew what that meant.

The Mantle was expelling its rotational momentum. *Glitch.*

Suddenly, for the first time, he felt lost, vulnerable, alone in the sky. He couldn't help but cry out, longing to be back in the remote wooden womb of Parz.

He forced himself to concentrate. He wasn't in any direct danger yet. With luck, and skill, he could still get through this.

Still he pushed across the sky, keeping in line with the drifting vortex lines. But now he slowed a little, glancing around. He was virtually alone now; of the hundred starters in the race, perhaps thirty were still on their boards, paralleling his path through the Air. Of the rest - of the marshals - there was no sign. The City still hung in the Air like a dusty lantern, solid and unperturbed.

The vortex lines were drifting faster. They looked tangled, untidy. Looking more closely he saw instabilities searing along the lines from both upflux and downflux; the huge, complex waveforms passed through each other, seeming to drag and reinforce each other.

He looked over his shoulder at the far upflux. There the Air glowed yellow, empty. *No vortex lines at all.*

Now purple light flooded up through the Air, sudden, shocking, so that his board cast a shadow over his legs and arms. He leaned over his board, glanced down.

The Quantum Sea had exploded, right under the City; a neutrino fount rose steadily towards Parz, like an immense fist.

Resentment flooded Cris. *No*, he thought. *Not today. Not on my day . . .*

The Magfield surged again, ramming upwards into his board with force and immediacy.

I was winning! Oh, I was winning!

Like a fragment of food swimming towards its own consumption, the crude wooden cylinder with its precious cargo of people and animals laboured towards the unblemished mouth of the Ur-human artifact.

Dura worked with the Air-pigs, feeding and patiently soothing as their farts drove the turbine. To bring the ‘Pig’ to the wormhole mouth Hork had taken the ship through a long, flat sweep to a position above one facet of the Interface. Through the wide windows she watched the wormhole gate sink briefly into the turgid glimmering of the underMantle, to reemerge as if surfacing as they approached it once more.

Now the Interface rose towards them, like an outstretched hand framed in the clearwood panel set into the base of the ship; within it light flashed, impossibly distant and vortex-line blue.

Hork worked his controls with savagery. For all his outer flippancy in the earlier stages of the voyage, he seemed to have become enraged since the encounter with Karen Macrae. Or perhaps that anger had been there in him all along, Dura thought; perhaps he had always resented the position of humans, left stranded and helpless in this Star. But now, for the first time, he had a focus for that rage: Karen Macrae, and her intangible Colonist companions in the Core of the Star.

Dura wondered at her own composure. She was fearful, yes; and an inner fluidity threatened to overwhelm her as she stared into the approaching maw of the wormhole. But at the same time, she realized, *she was not confronting the unknown*, as was Hork. The lore of the Human Beings was calm, detailed and analytical. The universe beyond the Star, the universe of the past beyond the here-and-now: those realms were abstract, remote, but they were as real to Dura as the world of Air, pigs, trees. Although she had never seen them she had grown up with the Xeelee and their works, with the artifacts of the Ur-humans, and to her they were no more exotic than the wild Air-boars of the Crust.

Perhaps, in the end, the lore of the Human Beings - their careful, almost obsessive, preservation of apparently useless knowledge from the past - was actually a survival mechanism.

The Interface was very close now, Dura saw; the fine, perfect vertices of the upper face spread away from the curving window of the ship, and the rest of the frame was foreshortened by perspective.

Then the clean lines of the artifact began to slide *across* the windows of the ship, as slow as knife-blades drawn across skin. The ship’s downward trajectory had been carrying it steadily towards the centre of the face; but now they were clearly drifting, sliding towards one knife-sharp edge.

Something was wrong.

Hork hauled at his levers and slammed his hand into the fragile console. ‘Damn it. She won’t respond. The Magfield here is disrupted - maybe by the presence of the Interface - and ...’

‘Look!’ Dura pointed downwards.

Hork stared at the edge, its fizzing blue light painting deep, shifting shadows on his face as it approached. He swore. ‘It’s going to hit us.’

‘We might be safe. Maybe the Ur-humans designed this wormhole to be as safe as possible; maybe the ship will just rebound, and . . .’

‘Or maybe not. Maybe the Ur-humans didn’t expect anyone to be stupid enough to go careering through their doorway in a wooden ship. I think that damn thing is going to cut us in two.’

The Interface edge, wheeling past the windows, had widened from the abstraction of a line into a glowing rod as broad as a human arm.

Dura wrapped her arms around herself. Behind her, the pigs were a comforting, warm mass, an oasis of familiarity. ‘At least try. Maybe you can get a purchase on the Interface’s magnetic field.’

Now, beyond the walls of the ship, there was a spectacular flash, a sudden storm of blue-white light which flooded the cabin and made her cry out. The pigs squealed, terrified again. The ship lurched. Hork rolled in his seat and Dura grabbed at the pigs’ restraining harness.

‘We’ve hit!’ she cried.

Hork dragged at his levers. ‘No. It’s the ship’s own field; it must be brushing against the edge ... The ship’s responding. Dura, I think you’re right; I think we’re starting to work against the artifact’s field. Keep feeding those animals, damn you!’

The flashing persisted and the shuddering of the ship assumed a steady, violent rhythm. Dura clung to the pigs’ harness, striving to feed the pigs with an unwavering rhythm of her own.

Slowly, painfully slowly, the wheeling of the edge lessened, and the blue glare which had filled the cabin began to diminish. Dura glanced through the windows; the edge was receding and the magnetic flashes lessened, growing fitful and irregular, before dying completely.

The three edges of the face were all around the ship now, a fence of pale light slowly ascending past her. At last the ship was passing through the face, Dura realized; they were actually entering the Interface.

‘Yes,’ she murmured. ‘But we’re hardly safe.’

Hork raised his hands over the control panel. Then he pushed all three of his levers forward, deliberately; the ship surged forward into the Interface. She heard the hum of current in the Corestuff bands around the hull. ‘We go on,’ Hork said.

Dura had expected to make out the blue lines of the Interface, this box of light, from the inside. But there was no sign of the other faces, the rest of the wormhole; instead, beyond the walls of the ship, there was only a darkness even deeper than the twilit glow of the underMantle. It was as if they were entering - not a box of light - but the mouth of a corridor, like one of Parz’s dingy alleys. In fact, it seemed that she *could* make out the lines of a corridor, stretching through the wormhole and on into infinity; black on black, it was like staring into a throat. Deep in the corridor there were flashes - sharp, silent and distant, light which splashed briefly over the dim walls. Slowly a picture assembled in her mind, each flash providing another fragment; the corridor was a smooth-walled cylinder perhaps five mansheights across and . . .

And how deep?

The walls were all around them now; the ebony throat enclosed the fragile craft as if it had been swallowed. She felt a rush of Air through the capillaries of her head; illuminated in stabs, fragments of the walls raced upwards past the ship like pieces of a dream. The walls seemed to converge at a great distance, closing around a point at infinity. But that was impossible - wasn’t it? - because the Interface itself, the four-faced frame of light, was only ten or a dozen mansheights across.

But of course the corridor was immensely long - impossibly long - for the very purpose of a wormhole was to connect far-distant places. And now she was entering such a wormhole; soon the ship would be passing through the device to emerge ...

Somewhere else.

For a moment, fear, primitive, irrational and stark, surfaced in her mind; it was as if the mystery of it all was ramming itself into her eyes, ears and mind. She closed her eyes and wrapped her fingers in the soft leather of the pig harness. Was she, now, going to crumble into superstitious panic?

The wormhole was an artifact, she told herself. And an artifact built by humans - by Ur-humans, perhaps, but by humans nonetheless. She should

not cringe before a mere device.

She forced her eyes open.

The ship shuddered.

Dura cried, ‘Too fast! You’re going too fast, damn it; we’ll turn over if you don’t slow down . . . Are you crazy?’

The control levers were still buried inside Hork’s fleshy hands, but when he turned to her his wide face was empty, wondering. ‘It’s not me,’ he said slowly. ‘I mean, it’s not the ship ... we’re no longer propelling ourselves. Dura, we’re being drawn into the wormhole.’ He stared at the little control console, as if seeking an answer there. ‘And there’s nothing I can do about it.’

Cris rode the turbulent Magfield almost automatically. He stared at the neutrino fount, fascinated, almost forgetting his own peril. The fount was a tower, dark, unimaginably massive, thrusting out of the turbulent mass of the Quantum Sea. As it rose into Mantle Air, the viscous purple Sea-stuff crusted over, shattering, the fragments spiralling upwards around the dense-packed flux lines of the Magfield.

Here was stuff from deep in the heart of the Star - deeper than any Bell had gone, deeper perhaps even than Hork’s wooden ship would reach. Here was an expulsion of material from the immense, single nucleus that was the soul of the Star, from within the nebulous boundary between Sea and Core. The fount’s material was hyperonic; each hyperon was a huge cluster of quarks far more massive than any ordinary nucleon, and the hyperons were bound together by quark exchanges into complex, fractal masses. But as the material spewed up through the throat of the Pole its structure was collapsing, unable to sustain itself in the lower-density regime of the Mantle. The quark bags were breaking apart, releasing a flood of energy, and reforming as showers of nucleons; and the free nucleons - protons and neutrons - were congealing rapidly into chunks of cooling nuclear matter.

That deadly hail was now lancing through the Mantle, and would soon come streaming upwards around the City. And he felt the energy released by that huge wave of hyperonic decay as it surged upwards, the neutrinos sleeting through his body, hot and needle-sharp, on their way to the emptiness above the Crust.

Now, even as he watched, the spiralling paths of the charged chunks of freezing Core-matter seemed to be distorting - flattening - as if the Magfield

itself were changing, in response to the disaster.

Suddenly Cris understood.

The Magfield *was* changing. The irruption of this immense freight of charged material from the Core had disrupted the field; the Sea-fount was like an electrical current, unimaginably strong, passing through the heart of the Star's Magfield Pole, temporarily competing with the great magnetic engines at the Core of the Star itself. What he'd felt - the unexpected surges in the field - had been no more than distant echoes of that huge disturbance.

. . . But now another of those magnetic echoes hurtled up around him. This time his feet slipped from the board and he fell forward, crying out; the board slammed against his chest and thrust him upwards towards the Crust. He clung to the board helplessly, his legs scrabbling across its smooth surface, as he rose faster than he could ever have Surfed. If he lost the board he was finished, he knew. His mind raced. Perhaps he would be thrown beyond the Crust, board and all! What then? Would his body collapse into cooling fragments in the emptiness beyond, just as the Core material froze in the Mantle?

As it happened, would he be *aware*?

But the upward surge subsided, as suddenly as it had come.

The board stabilized in the Air. Gasping, Cris dragged himself forward across the board; his chest ached from the pressure of the board in its flight. There was the City, far below him, but still close enough for him to make out detail - the Spine, the gaping cargo ports, the encrustation of Garden on its upper surface. He felt a surge of relief, and even a little shame; he couldn't have been thrown so impossibly high after all.

Carefully, cautiously, he tucked his knees under him, rested his feet against the board, and stood up. The Magfield was quivering like a live thing under him, and he rocked the board against it, tilting his aching ankles; but, for the moment, the field was fairly stable. Predictable. He could Surf on it . . . and he was going to have to, if he was to make it through this.

He glanced around the sky. He was alone now; there was no sign of any of the other hundred Surfers. Again he felt a burst of triumph, accompanied by shame. Had he survived because he was the best? Or the luckiest, perhaps?

And, he reminded himself, he might join the rest in the anonymity of death yet, before this day was through.

The vortex lines around him writhed, tortured by instabilities, by impossible, ungainly forms which warped as they propagated, gathering energy. The *end* of the vortex lines - the boundary of the volume of Air in which there were no vortex lines - was rushing towards him, a wall of emptiness. In that region, he knew, the turbulence of the Air, lashed by the neutrino storm from the Core, was such that its superfluid properties had broken down. He wouldn't be able to Surf; the friction would be impossible. Damn it, he wouldn't be able to *breathe*. His capillaries would clog, his heart strain at the thickening Air . . .

He shook his head, tried to focus. He looked down. He had to get back to the City before the turbulence reached him. (That remote part of him prodded his mind over this. Why should he be any safer in the City than outside?) Again he shook his head, growling at himself. The City was the only place to go, safe or not. Therefore he would go there. But already the chunks of frozen Sea-stuff were hurtling up around the City. A graze from one of those . . .

Thinking about it was pointless. He spread his feet against the board, bent his legs, and thrust.

He Surfed as he'd never Surfed before - perhaps as nobody had Surfed before. He thrust at the board again and again, ramming its Corestuff web across the shaking Magfield. He soared between rippling vortex lines, ducking and swooping. Soon he was moving so quickly that the residual normal-fluid component of the Air whipped at his hair, his face. But still he accelerated, slamming his feet against the board until his soles ached.

There was something in the distance, a new factor in the chaos the sky had become. He risked a brief glance. He saw lines crossing the sky, lancing down through the Crust across the vortex lines, and penetrating the Core - blue-white beams which stirred the Core like spoons.

Now he was entering the inverted rain from the exploded Sea. The frozen Sea-fragments were irregular, solid chunks, two or three mansheights across. They tumbled upwards through the Air around him, sharp edges sparkling, Sea-purple laced through their interior. The fragments had their own, whirling magnetic fields; ghostly flux-fingers plucked at Cris as they passed him. He followed a curving path, dipping down over the Pole

towards the City; flexing his legs, his hips, his neck, he slalomed through the crumbling vortex lines, the Sea-fragments.

What sport! It was wonderful! He roared aloud, yelling out his exhilaration.

The City was ahead of him now. It seemed to balloon out of the Air, its Skin swelling before him, uneven, ugly, as if being inflated from within.

He was almost home.

By the blood of the Ur-humans, he thought. *I might actually live through this*. And if he did, what a tale he would have to tell. What a hero he would become . . .

But now the Magfield surged again, betraying him.

This time he fell back; his spine was slammed against his board. The breath was knocked out of him, and he tumbled off the board, vainly clutching for its rim.

The board fell away from him, tumbling across the face of the City.

Falling naked through the Air, he watched the board recede. He tried to Wave, to rock his legs through the Air, but his strength was gone; he could get no purchase on the Magfield.

He was moving too fast, in any case.

Oddly he felt no fear, only a kind of regret. To have come so close and not to have made it . . .

The Skin of Parz was huge before him, a wall across the sky.

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23

All around the City, cooling fragments of the Quantum Sea, huge and threatening, streamed upwards from the Pole. In the Stadium, there was panic.

Adda leaned forward in his cocoon and peered down. The bulk of the Stadium was a turbulent mass of human torsos and struggling limbs; even as he watched, the network of delicate guide ropes which had criss-crossed the Stadium collapsed, engendering still more chaos as a thousand people struggled to escape. The crowd, screaming, sounded like trapped animals. Lost in the melee, Adda saw the purple uniforms of stewards and food vendors scrambling along with the rest.

They all wanted to get out, obviously. But get out to what? Where was safety to be found - inside the cosy Skin of the City? But that Skin was just a shell of wood and Corestuff ribs; it would burst like scraped leather if ...

He was kicked in the back, hard. He gasped as the Air was forced out of his lungs, and he fell forward; then the rope fixing his cocoon on one side parted, and he was spun around.

He struggled out of his cocoon, ignoring the protests of stiff joints, and prepared to take on whoever had struck him. But it was impossible to tell. The Committee Box was full of panicking courtiers, their made-up faces twisted with fear, fighting free of cocoons and restrictive robes. Adda opened his mouth and laughed at them. So all their finery, and fine titles, offered no protection from mortal terror. Where was their power now?

Muub was struggling out of his own cocoon with every expression of urgency.

Adda said, ‘Where will you go?’

‘The Hospital, of course.’ Muub gathered his robes tight around his legs and glanced around the Box, looking for the fastest way out. ‘It’s going to be a long day’s work ...’ Apparently on impulse, he grabbed Adda’s arm. ‘Upfluxer. Come with me. Help me.’

Adda felt like laughing again, but he recognized earnestness in Muub’s eyes. ‘Why me?’

Muub gestured to the scrambling courtiers. ‘Look at these people,’ he said wearily. ‘Not many cope well in a crisis, Adda.’ He glanced at the upfluxer appraisingly. ‘You think I’m a little inhuman - a cold man, remote

from people. Perhaps I am. But I've worked long enough as a Physician to gain a functional understanding of who can be relied on. And you're one of them, Adda. Please.'

Adda was surprisingly moved by this, but he pulled his arm free of Muub's grasp. 'I'll come if I can. I promise. But first I have to find Farr - my kinsman.'

Muub nodded briskly. Without another word he began to work his way through the crowd of courtiers still blocking the Box's exit, using his elbows and knees quite efficiently.

Adda glanced down at the crowded Stadium once more. The crush there was becoming deadly now; he saw imploded chests, limp limbs, Air-starved faces like white flowers in the mass of bodies.

He turned away and launched himself towards the exit.

Farr could be in any of a number of places - with the Skin-riders outside the City itself, or up somewhere near the Surfer race, or down in the Harbour with his old work-friends - but he would surely make for the Mixxaxes' to find Adda. The Mixxaxes' part of the mid-Upside was on the opposite side of Parz, and Adda began the long journey across a City in turmoil.

It was as if some malevolent giant, laughing like a spin-storm, had taken the City and shaken it. People, young and old, the well-dressed rich and drab manual workers alike, fled through the corridor-streets; screams echoed along the avenues and Air-shafts. Perhaps each of these scurrying folk had some dim purpose of their own in the face of the Glitch - just as Adda did. But collectively, they swarmed.

To Adda it was like a journey through hell. Never before had he felt so confined, so enclosed in this box built by lunatics to contain lunatics; he longed to be in the open Air where he could *see* what the Star was doing. He reached Pall Mall. The great vertical avenue was full of noise and light; people and cars swarmed over each other, Speakers blaring. Shop-fronts had been smashed open, and men and women were hastening through the crowds with arms full of goods - clothes, jewellery. Above his head, at the top of the Mall - the uppermost Upside - the golden light of the Palace Garden filtered down through the miniature bushes and ponds, as peaceful and opulent as ever. But now lines of guards fenced off the grounds of the Palace from any citizen who thought that might be a good direction to flee.

Adda, close to the centre of the Mall now, felt an absurd impulse to laugh. *Guards. Looters* . . . What did these people hope to achieve? What did they think was happening to the world around them? It would be a triumph if their precious City survived this disaster intact enough for the looters to find an opportunity to flaunt their ill-gotten wealth.

As if in response to his thought, the City *lurched.*

The Mall - the huge vertical shaft of light and people around him - *leaned* to the right. He flailed at the Air, scrabbling for balance. The street had shifted with shocking suddenness. There was an immense groan; he heard wood splintering, clearwood cracking, a high-pitched scream which must be the sound of a Corestuff rib failing.

People rained through the Air.

Helpless, they didn't even look human - they were like inanimate things, carvings of wood, perhaps. Their bodies hailed against shop-fronts and structural pillars; the Mall echoed with screams, with small, sickening crunches.

A woman slammed against Adda's rib-cage, knocking away his breath once more. She clung to him with desperate strength, as if she thought he might somehow save her from all this. She must have been as old as Adda himself. She wore a rich, heavy robe which was now torn open, revealing a nude torso swathed in fat, her loose dugs dangling; her hair was a tangled mess of blue-dyed strands with yellow roots. 'What's happening? Oh, what's happening?'

He pulled the woman away from his body, disengaging her as kindly as he could. 'It's a Glitch. Do you understand? The Magfield must be shifting - distorted by the charged material erupting from the Quantum Sea. The City is trying to find a new, stable ...'

He stopped. Her eyes were fixed on his face, but she wasn't listening to a word.

He pulled her robe closed and tied it shut. Then he half-dragged her across the Mall and left her clinging to a pillar before a shop-front. Perhaps she'd recover her wits, find her way to her home. If not, there was little Adda could do for her.

He found an exit to a side-street. He Waved his way down it with brisk thrusts of his legs, trying to ignore the devastation around him.

The journey through the wormhole lasted only heartbeats, but it seemed an eternity to Dura. She clung to her place, feeling as helpless and as terrified as the squealing pigs.

Out of control, despite all Hork's vain heavings at the console, the 'Flying Pig' rattled against the near-invisible walls of the corridor. Spectacular flashes burst all around the clumsy vessel.

The end came suddenly.

Light - electric blue - blossomed from the infinity point, beneath the plummeting craft at the terminus of the corridor. The light hurtled up the corridor like a fist, unavoidable. Dura stared into it, feeling its intensity sting her eyes.

The light exploded around them, flooding the ship and turning the cabin's lanterns into green wraiths. The pigs screamed.

Then the light died away - no, she realized; the light had *congealed* into a framework around them, another tetrahedral Interface. The finely drawn cage of light turned around them with stately grace; evidently the 'Pig', spewed out of the wormhole, had been brought almost to rest, and was now tumbling slowly.

Beyond the cage of light there was only darkness.

Dura glanced around the ship. There wasn't any obvious sign of damage to the hull, and the turbine was still firmly fixed in place. The squeals of the pigs, the stink of their futile escape-farts, slowly subsided.

Hork remained in the pilot's seat. He stared out of the windows, his large mouth gaping like a third eyecup in the middle of his beard.

Dura drifted down towards him. 'Are you all right?'

At first her question seemed not to register; then, slowly, his head swivelled towards her. 'I'm not injured.' His face twisted into a smile. 'After that little trip, I'm not sure how healthy I am, but I'm not injured. You? The pigs?'

'I'm not damaged. Nor are the animals.'

'And the turbine?'

She admired his brisk dismissal of the wonders of the journey, his focus on the practical. She shrugged.

He nodded. 'Good. Then we have the means to move.'

' ... Yes,' she said slowly. 'I suppose so. But only if the Magfield extends this far.'

He studied her face, then peered out of the craft uncertainly. ‘You think it mightn’t? That we’ve moved beyond the Magfield?’

‘We’ve come a long way, Hork.’

She turned away, dropping her eyes to her hands. The shadows cast on her skin were soft, silvery; the diffuse glow seemed to smooth over the age-blemishes of her flesh, the wrinkles and the minute scars.

. . . *Silvery?*

Outside the ship, the light had changed.

She moved away from Hork and peered out of the ship. The vortex-blue tetrahedron had disappeared. There was a *room* around the ship now, a tetrahedral box constructed of some sheer grey material. It was as if this skin-smooth substance had plated over the framework, turning the Interface from an open cage into a four-sided box which encased the ‘Pig’.

The walls weren’t featureless, though. There was some form of decoration - circular, multicoloured patches - on one wall, and, cut in another, a round-edged rectangle which could only be a door.

. . . A door to what?

Hork scratched his scalp. ‘Well. What now? Did you see where these walls came from?’

Dura pressed her face to a clearwood window. ‘Hork, I don’t think we’re in the underMantle any more.

‘You’re guessing.’ His face was creased with frustration.

She pointed to the room beyond the window. ‘I think that’s Air out there. I think we could live out there.’

‘How can you know that?’

‘Of course I can’t *know*.’ Dura felt a calm certainty fill her. She was starting to feel safe, she realized, to trust the powers into whose hands she’d delivered herself. ‘But why would we be brought to a place which is lethal for us? What would be the point?’

He frowned. ‘You think this is all - designed? That our journey was *meant* to be this way, to bring us here?’

‘Yes. Since we entered the wormhole we’ve been in the hands of the ancient machines of the Ur-humans. Surely they built their machines to protect us. I think we have to trust them.’

Hork took a deep breath, the fine fabric of his costume scratching over his chest. ‘You’re saying we should go out there. Shut down the turbine and

our magnetic shell - leave the “Pig” and go outside.’

‘Why else did we come here?’ She smiled. ‘Anyway, I want to see what those markings on the wall are.’

‘All right. If we’re not crushed in the first instant we’ll know you’re right.’ The decision made, his manner was brisk and pragmatic. ‘And I guess the pigs need a rest anyway.’

‘Yes,’ Dura said. ‘I believe they do.’

Hork turned to his control console and threw switches. Dura tended to the pigs, providing them with healthy handfuls of leaves. As they fed, their flight-farts died to a trickle and the turbine slowed with a weary whirr.

The cabin fell silent, for the first time since the departure from Parz.

Hork whispered, ‘It’s gone. Our magnetic field. It’s shut down.’

For a moment Hork and Dura stared at each other. Dura’s heart pounded and she found it impossible to take a breath.

Nothing had changed; the ship still tumbled slowly within the cool grey walls of the wormhole chamber.

Hork grinned. ‘Well, we’re still alive. You were right, it seems. And now ...’ He pointed to the hatch in the upper end of the craft. ‘You first,’ he said.

The hatch opened with a soft pop.

Dura winced as gas - *Air?* - puffed into the ship past her face. She found herself holding her breath. With an effort of will she exhaled, emptying her lungs, and opened her mouth to breathe deeply.

‘Are you all right?’

She sighed. ‘Yes. Yes, I’m fine. It’s Air all right, Hork ... We were expected, it seems.’ She sniffed. ‘The Air’s cool - cooler than the ship. And it’s - I don’t know how to describe it - it’s fresh. Clean.’ Clean, in comparison to the murky Air of the City to which she’d grown accustomed. When she closed her eyes and drew in the strange Air it was almost like being back with the Human Beings in the upflux.

. . . Almost. Yet the Air here had a flat, lifeless, artificial quality to it. It was scrubbed clean of scents, she realized slowly.

Hork pushed past her and out into the room beyond. He looked around with fists clenched, aggressively inquisitive, his robe garish against the soft grey light of the walls. Dura, suppressing pangs of fear, followed him away from the wooden ship’s illusory protection.

They hung in the Air of the wormhole chamber. The ‘Flying Pig’ tumbled slowly beside them, a scarred wooden cylinder crude and incongruous within the walls of this finely constructed room.

‘If the Ur-human builders could see us now, I wonder what they would say?’

Hork grunted. ‘Probably, “Where have you been all this time?”’ He Waved experimentally and moved forward a mansheight or so. ‘Hey. There’s a magnetic field here.’

‘Is it the Magfield?’

‘I don’t know. I can’t tell. If it is, it’s weaker than I’ve ever felt it before.’

‘Maybe it’s artificial . . . put here to help us move around.’

Hork grinned, his confidence growing visibly. ‘I think you’re right, Dura.

These people really were expecting us, weren’t they?’ He looked over his shoulder at the ‘Pig’, inspecting the ship briskly. He pointed, his embroidered sleeve flapping. ‘Look at that. We’ve brought a passenger.’

Dura turned. There was something clinging to the side of the craft; it was like a huge, metallic leech, spoiling the clean cylindrical lines of the ship. ‘It’s Corestuff,’ she said. ‘We’ve brought a Corestuff berg with us, all the way through the wormhole. It must have stuck to our field-bands . . .’

‘Yes,’ Hork said. ‘But by no accident.’ He made a mock salute to the lump of Corestuff. ‘Karen Macrae. So glad you could accompany us!’

‘You think she’s in there? In that berg?’

‘Why not?’ He grinned at her, his eyecups dark with excitement. ‘It’s possible. Anything’s possible.’

‘But why?’

‘Because this trip is as important to Karen Macrae as it is to us, my dear.’ Dura flexed her legs; the Waving carried her easily through the Air. She moved away from the hulk of the ‘Pig’ and towards the walls of the chamber. Tentatively she reached out a hand, placed it cautiously on the grey wall material. Beneath her fingers and palm its smooth perfection was unbroken. It was cool to the touch - not uncomfortably so, but a little cooler than her body.

‘Dura.’ Hork sounded excited; he was inspecting the wall display Dura had seen from within the ‘Pig’. ‘Come and look at this.’

Dura Waved briskly to Hork; side by side they stared at the display.

Two circles, differing in size, had been painted on the wall. The larger was coloured yellow and was perhaps a micron wide. The colour was deepest at the heart of the circle and lightened, becoming almost washed out, as the eye followed the colour out to the edge of the circle. The disc was marred by a series of blue threads which swept through its interior - a little like vortex lines, Dura thought, except that these lines did not all run in parallel, and in places even crossed each other.

Each blue line was terminated by a pair of tiny pink tetrahedra, one at each end. Most of the tetrahedra had been gathered into the centre of the disc, so that the lines looped around the heavy amber heart of the disc. But five or six of the lines broke free of the knot at the centre. One of them terminated at a pole of the disc, just inside its surface. The rest of the lines led, in wavering spirals, out of the disc itself, and crossed the empty space of the intervening wall to the second, smaller circle; a half-dozen tetrahedra jostled within the small circle like insects.

Dura frowned, baffled. ‘I don’t understand. Perhaps these little tetrahedra have something to do with the wormholes ...’

‘Of course they do!’ Hork’s voice was brisk and confident. ‘Can’t you see it? It’s a map - a map of the entire Star.’ He traced features of the diagram with his fingertip. ‘Here’s the Crust; and within it - this outermost, lighter band - is the Mantle, which contains the Air we breathe. All the world we know.’ His fingertip gouged a path into the heart of the Star image. ‘These darker sections are the underMantle and the Quantum Sea - and here’s the Core.’

‘And the tetrahedra, the threads connecting them ...’

‘ ... are maps of the wormholes!’ His eyecups were wide and filled with the grey light of the chamber. ‘Isn’t it obvious, Dura? Look.’ He jabbed at the ‘Core’. ‘And here are the wormhole Interfaces, brought into the Core by the Colonists after the Core Wars. Most of the Interfaces, anyway. And so the wormhole corridors - marked by these threads - lead nowhere but back to the Core.’

The implications of his words slowly sank into her. ‘So there are many wormholes - dozens, hundreds - not just the one we travelled in?’

‘Yes. Just think of it, Dura; once the wormholes must have riddled the Star.’ He shook his head. ‘Well, the Colonists put a stop to that. Now we’re

reduced to crawling around the Star in wooden boxes drawn by Air-pigs.' Again anger, resentment welled in his voice.

'Do you think we're still here?' She pointed to the Core of the Star map, at the knot of wormholes which looped around it.

'No,' he said briskly. 'Why would we be given an Interface which took us into the Core? Remember, the Colonists have a goal too - they also have to find a way to stop the Glitches. They surely can't use the wormholes themselves - after all, we know the wormholes were built for humans. Real humans, I mean. Us. So they have to rely on us.'

She found herself shivering. 'Then if we're not in the Core, we must be *here*.' She drew her finger along the threads of wormhole paths which left the main circle and crossed the grey spaces to the second, smaller disc. ' . . . *Outside the Star*.' She looked at him. 'Hork - what are we going to find when we open the door to this chamber?'

He stared into her eyes, his brashness gone, utterly unable to answer.

Farr was waiting for Adda at Toba Mixxax's home. Ito Mixxax was there, but not Toba or Cris. The City-tilt had made a mess of the Mixxaxes' domesticity: crockery and other material had been smashed against the walls, and fragments drifted in the Air.

Ito had her arm around Farr, trying to comfort or reassure him; when Adda opened the door to the home, Farr greeted his arrival with relief, a smile, while Ito looked merely disappointed that it wasn't her husband or son. They were both uninjured, though Farr looked shocked. Adda came to them both and placed a hand on their shoulders. The three of them drifted there, at the centre of the Mixxaxes' cosy room, their human warmth sufficient for a brief moment.

Then they pulled apart. Ito Mixxax looked drawn, but composed. 'What are you going to do? Do you want to stay here?'

He looked at Farr. The boy must be worried sick about his sister. But it would do no good to stay here and let him brood. Besides, despite its lingering domesticity, what sanctuary was this place, any more than the rest of Parz? 'We're going to the Hospital,' he said firmly. 'Or at least, we'll try to get there. We'll find work to do there. What about you?'

'Toba was with me at the Games. In the Stadium.' She sighed, looking more weary than afraid. 'We got separated. I'll have to wait for him here. Then we'll start searching for Cris, I suppose. We ought to be able to get the

car out of the City.' She looked at Adda, appraising him, evidently trying to concentrate on his needs. 'Do you want to rest here? Are you hungry?'

'No.' He reached for Farr; the boy took his hand, meekly, like a child. 'Come on, Farr. It's not food they'll be short of in that damn Hospital, but strength, and courage, and ingenuity. And ...'

There was an explosion from the heart of the City - no, not an explosion, Adda thought, but an immense tearing sound, a huge exhalation.

There was a moment of stillness. Then a shock passed through the City.

The very fabric of the structure seemed to flex. The little room rattled around them, and the fragments of crockery, already smashed, rattled in a thin hail against the walls.

When the tremor had passed, Farr asked, 'What was that? Another settling in the Magfield?'

'I don't think so. That was sharper - more abrupt . . . Come, lad. Let's move.'

Ito kissed them both quickly on the cheek. 'Be safe,' she said.

The Hospital of the Common Good was in the upper Downside, and Adda decided that the quickest way to get there - the most likely to be clear - would be through Pall Mall. So he and Farr Waved along one of the main artery streets towards the broad axis of the City. It was a little easier to move now, Adda found; most people must have reached whatever destination they had been looking for - or, he reflected sadly, be lying hurt in some corner of the City. But the Air-cars were an increased menace. The cars soared along the emptying streets behind teams of terrified Air-pigs; several times the Human Beings had to lurch aside to stop themselves being run down. Once they came across a car which had embedded itself nose-first into a shop-front. There was no sign of the driver, but the Air-pig team was still attached to its harness. The pigs strained against their restraints, their circular mouths wide as they screamed.

Farr loosened the harness. Released, the pigs fled away into the shadows of the corridors, caroming from the walls like toys.

They reached the junction of the artery-street and the Mall. Adda rested at the street's rectangular lip for a moment, then prepared to launch himself out into the main shaft. But Farr grabbed his arm and held him back. The boy pointed downwards. Adda stared into his face, then squinted down, blinking to clear his good eyecup.

The lower end of the Mall - the huge spherical Market - was filled with light. Too much light, which glinted from the guide rails, stall sites, the huge execution Wheel ... Yellow Air-light, which flooded into the heart of the City from a new, ragged shaft that cut right through the Mall itself, just above the Market.

So here was the cause of the shock they had experienced with Ito.

The edges of the shaft were neat - so neat that Adda might almost have thought it was man-made, another avenue. But the cross-section of this shaft was irregular - formless, nothing like the precise rectangles and circles which defined Parz - and it was off-centre, askew, too wide.

Adda drifted out into the Mall a little way and stared down at the gash.

The inner skin of the Mall had been sloughed away, shops and homes scoured off as cleanly as if by a blade. And within the gash itself he could see the cross-sections of cut-open homes, shops. There were splashes of broken flesh. He heard human voices, but no screams: there were groans, and low, continuous weeping.

Farr joined him in the Air. ‘What is it? What’s happened?’

‘A Sea-fragment,’ Adda said grimly. ‘The City has been hit. Looks as if the berg passed straight through ... We’re lucky the City wasn’t smashed wide open . . . Come on, Farr. Let’s see if that damn Hospital is still working.’

They dropped down the wide, almost empty shaft of the Mall, searching for a way to get to the Hospital.

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24

Hork ran his thick fingers round the seam of the door. Then, impatient, Waving to give himself leverage, he laid his hands flat against the door and shoved.

The door swung back on invisible hinges, heavy and silent; Air hissed.

Through the doorway Dura caught glimpses of another, larger chamber, walled by more of the featureless grey material.

For a moment Hork and Dura hesitated before the doorway.

‘Let’s get on with it,’ Hork growled. He grasped the edges of the doorframe. With a single fluid movement he hauled his bulk through; his small feet, Waving gently, disappeared into the frame.

With a sigh, Dura took hold of the frame. Like the rest of the wall material the frame edges were cool to the touch, but the walls seemed knife-thin and the edges dug into her palms. She laid her hands carefully on the outer surface of the wall, beyond the frame, and pushed herself through.

The outer chamber was another tetrahedron - and constructed of the ubiquitous grey-bland material - but perhaps ten times as large, a hundred mansheights across or more. This room would be as large as any enclosed space in Parz City. The chamber from which she had emerged floated at the heart of this new room, its vertices and edges aligned with the chamber within which it was embedded. Dura wondered vaguely what was holding the smaller chamber in place; there were no signs of struts, supports or ropes.

Perhaps they were in a nest of these tetrahedral chambers, one contained in the other, she speculated; perhaps if they went beyond these walls they would swim into a third chamber, ten times larger again, and then onwards ...

But there was no door in this outer chamber. The walls were featureless: unbroken even by the map device which had adorned the inner cell. There must be no way out; maybe this was the end of their journey.

Hork came Waving towards her. ‘Dura. I’ve found something.’ Taking her by the hand he half-dragged her around the inner cell. He Waved to a stop, causing Dura to bump against him, and pointed to his find. ‘There. What do you think of that?’

It was a box, irregularly shaped, about half a mansheight across. Dura circled the thing warily a few microns from where it hovered in the Air. Sculpted of the familiar grey wall material, it consisted of a massive block from which a thinner rectangular plate protruded; smaller cylinders stretched forward from the sides of the rectangle . . .

Its function was unmistakable.

'It's a *seat*,' she said.

Hork snorted impatiently. 'Obviously it's a damn seat.' He prowled around the object, poking boldly at its surfaces. Levers - thick stumps apparently designed for human fists - protruded from the end of each of the chair's arms. A swivelling pointer was inset into the left arm.

Dura asked, 'Do you think it's meant for us . . . I mean, for humans?'

Hork groaned. 'Of *course* it is.'

Dura was offended. 'There's nothing obvious about this situation, Hork. If that map was right, we've travelled across space - away from the Star itself. Why should we expect anything but utter strangeness? It's a miracle we've found Air to breathe, let alone ... *furniture*.'

He shrugged; the fat-covered muscles flowed under his coverall. 'But this is obviously meant for humans. See how the back, the seat have been moulded?' And, before Dura could protest, Hork swivelled his bulk through the Air and settled into the chair. At first he wriggled, evidently uncomfortable - he even looked alarmed - but soon he relaxed and assumed a broad smile. He rested his hands on the arms of the chair; it seemed to match the shape of his massive body. 'Perfect,' he said. 'You know, Dura, this chair must be three hundred generations old. And yet it looks as good as new, and it fits my bulk as well as if it had been designed by the best Parz craftsmen.'

Dura frowned. 'You didn't seem so happy when you got into the seat.'

He hesitated. 'It felt odd. The surfaces seemed to flow around me.' He grinned, his confidence recovering. 'It was adjusting to me, I suppose. It was disconcerting, but it didn't last long ... What do you think these levers are for?' His massive fists hovered over the rods protruding from the seat-arms.

'No!' She laid her hands over his.

After a moment he relaxed and lifted his hands away from the levers, leaving them untouched. 'Interesting,' he said mildly. 'These look just like

the control levers in the “Flying Pig”. Maybe there are some basic commonalities of human design, a certain way things just have to be ...’

‘But,’ she said firmly, ‘unlike with the “Pig” we don’t have the faintest idea what these controls are for.’

Hork looked like a reprimanded child. ‘Well, as you told me earlier, we’re not going to make any progress unless we take a few chances.’ He glanced down at the arrow device inset in the left arm of the seat. ‘What about this, for instance?’

Dura Waved closer. The arrow was a finger-thick cylinder hinged at its centre; it lay at the heart of a small crater gouged out of the chair. The crater’s rim was marked by a band divided into four quarters: white, light grey, dark grey, black. The arrow was pointing at the black quadrant. It seemed obvious that the arrow was designed to be twisted by the occupant of the chair.

Hork looked up at her. ‘Well? This seems harmless enough.’

Dura suppressed a manic giggle. ‘You haven’t the faintest idea what it *is* . . .’

‘Damn you, upfluxer, we didn’t come all this way to cower.’ And with a convulsive movement he grabbed the arrow and twisted it.

The device clicked through a quarter of a turn.

Dura flinched, wrapping her arms around her body. Even Hork could not help but wince as the arrow came to rest, pointing to the dark grey quadrant of the scale band. Then he exhaled heavily. ‘See? No harm done . . . In fact, nothing seems to have happened at all. And ...’

‘No.’ She shook her head. ‘You’re wrong.’ She pointed. ‘Look . . .’

Hork twisted in the seat.

The walls of the chamber had turned transparent.

Bzya was dozing, hands loosely wrapped around the Bell’s axial support pole, when the blue flashes started.

He snapped awake.

This had been a long, fruitless dive, and he had been looking forward to home, to breaking some beercake with Jool. But now something was wrong.

He scanned quickly around the cabin. Hosch, his only companion on this trip, was awake and alert; they shared a brief, interrogative glance. Bzya placed his hands gently on the polished, worn wood of the support pole. No unusual vibration. He listened to the steady hum of the great

Corestuff hoops which bound about the hull of the Bell; the sound was an even thrumming, telling him that the current from the City still flowed down the cables as steadily as ever, throwing a magnetic cloak around their frail ship. He looked through the nearest of the Bell's three small windows. The Air outside - if it could be graced with the name, this far down - was a murky yellow, but bright enough to tell him that they were somewhere near the top of the underMantle. He could even see the shadow of the Spine; they were still close to its lower tip, not much more than a metre below the City . . .

There. Another of the blinding blue flashes, just beyond the window. It was electron-gas blue and it seemed to surround the ship; shafts of blue light shone briefly through the small round windows into the cabin.

The Bell lurched.

Hosch wrapped his thin hands around the support pole. 'Why aren't we dead?'

It was a good question. Clouds of electron gas around a Bell usually meant current surges in the Corestuff hoops. Maybe the cable from the Harbour was fraying, or a hoop failing. But if that was so the Bell's field would fail almost immediately. The Bell should have imploded by now.

'The current supply is still steady,' Bzya said. 'Listen.'

They both held their breath, and looked into the Air; Hosch adopted the empty-eyed expression of a man trying to concentrate on hearing.

Another flash. This time the Bell actually rocked in the soupy underMantle, and Bzya, clinging tightly to the pole, was swung around like a sack. He pulled himself closer to the pole and wrapped his legs around it.

The supervisor's breath stank of meat and old beercake. 'Okay,' he said. 'We know the Harbour supply is steady. What's causing the flashes?'

'There have to be current surges in the Corestuff hoops.'

'If the City supply is steady that's impossible.'

Bzya shook his head, thinking hard. 'No, not impossible; the surges are just caused by something else.

Hosch's mouth pursed. '*Oh*. Changes in the Magfield. Right.'

The Bell wasn't malfunctioning; *the Magfield itself was betraying them*. The Magfield had become unstable, and it was inducing washes of charge flow in their protective hoops and dragging them away from their upward path to home.

‘What’s causing the Magfield to vary?’ Bzya asked. ‘Another Glitch?’

Hosch shrugged. ‘Hardly matters, does it? We’re not going to live to find out.’

There was an upward jolt, this time without the accompanying blue flash.

Bzya grasped the pole. ‘Feel that? That was the Harbour. They’re pulling us up. We’re not dead yet. They’re trying to ‘

And then the blue light came again, and this time stayed bright. Bzya felt the writhing Magfield haul at his stomach and the fibres of his body, even as it tore at the Bell itself.

Electron gas sparked from his own fingertips in streamers. It was really quite beautiful, he thought absently.

The Bell was hurled sideways, away from the Spine. Bzya’s hands were torn from the support pole. The Bell’s curving wall came up, like a huge cupped palm, to meet him. His face rammed into a window, hard. His body bent backwards as it crammed itself into the tight inner curve of the wall. The structure of the Bell shuddered and groaned, and there was a distant, singing sound above him. That was the cables breaking, he thought through his pain. He felt oddly pleased at his own cleverness at such a deduction.

The walls wrenched, settled; the Bell rolled.

He fell into darkness.

Beyond the transparent walls, huge, ghostly buildings hovered over the humans.

The third chamber was immense, sufficient to enclose a million Parz Cities. The walls - made of the usual grey material, it seemed - were so far away as to be distant, geometric abstractions. Maybe this strange place was a series of nested tetrahedra, going on to infinity ...

She Waved to Hork and reached out for him, blindly; still in the chair, he took her hands, and although his grip was strong she could feel the slick of fear on his palms. For a heartbeat she felt an echo of the passion they’d briefly found, in flight from terror during the journey.

The transparent structures hovered around them like congealed Air. They were translucent boxes hundreds of thousands of mansheights tall. And within some of the buildings more devices could be seen, embedded; the inner structures were ghosts within ghosts, grey on grey.

The tetrahedral box containing the ‘Pig’, the solid little chair, Hork and Dura themselves, were like specks of wood adrift in some mottled fluid. In fact, she realized, the whole of the tetrahedron they occupied was embedded *inside* one of the huge buildings; its grey lines sectioned off the space around them, and she looked out through its spectral flesh.

‘Why do you suppose we can’t see these things clearly? And I wonder what their purpose is. Do you think . . .’

Hork was peering up at the ‘building’ they were embedded in. He stared into its corners and at its misty protuberances, and then glanced down quickly at the chair he sat in.

‘What’s wrong?’

‘The ghost-building we’re inside. Look at it ... It has the same shape as this chair.’ The grey light of the translucent forms pooled in his eyecups. ‘It’s a hundred thousand times the size, and it’s made of something as transparent as clear- wood and thinner than Air . . . but nevertheless, it’s an immense - spectral - *chair*.’

She lifted her head. Slowly she realized that Hork was right. This immense ‘building’ - at least a metre tall - had a seat, a back; and there, so far above her it was difficult to see, were two arms, each with its control lever.

Hork grinned, his face animated. ‘And I think I know what it’s all for. Watch this!’

He twisted his body. His chair swivelled in the Air.

She gasped, Waving away in alarm; but the chair came to rest, and no damage seemed to have been done. ‘What are you doing?’

‘Don’t you understand yet? Look up!’

She tilted her head back.

The other ‘chair’ - the ghostly analogue - *had turned too*, swivelling to match Hork’s lurch.

‘See?’ he crowed. ‘The chair is keyed to mine, somehow; whatever I make mine do, the big one must follow.’ Hork swung this way and that, laughing like a child with a toy. Dura watched the giant analogue dance clumsily, aping Hork’s movements like some huge pet. Presumably, she thought, when the device swivelled, its substance must be moving around her - *through* her, in fact, like an unreasonable breeze. But she felt nothing -

at least, no more than an inner chill which could as easily be caused by her awe and fear.

At last Hork tired of his games. ‘I can make it do whatever I want. He looked a little more thoughtful. ‘And so if I pull these levers ...’

‘No. We need to work this out, Hork.’ She looked up. ‘This - ghost, this City-sized artifact - is a seat big enough for a giant . . .’

‘That’s obvious. But ...’

‘But,’ she interrupted, ‘a giant of a certain form . . . a human-shaped giant, metres tall.’ She studied his face, waiting for him to reach the same conclusions.

‘*Metres* . . . The Ur-humans.’

She nodded. ‘Hork, I think the ghost-seat is an Ur-human device. I think we’re in a little bubble of Air, floating inside an Ur-human room.’

She tilted her head back on her neck, feeling the flesh at the top of her spine bunch under her skull, and looked up into a ghost-room which abruptly made sense.

They were *inside* a huge Ur-human chair. But there were other chairs - four of them, she counted, receding into mistiness, like a row of cities. The chairs were placed before a long, flat surface, and she caught hints of a complex structure beneath and behind that surface. Perhaps that was some form of control panel. Looking further out, the tetrahedral structure surrounding all of this was a sketch drawn against fog.

Hork touched her arm. ‘Look over there.’ He pointed. On the side of the Ur-human room opposite the row of seats there was a bank of billowing gas - but that must be wrong, of course; she tried to forget her smallness, to see this through Ur-human eyes. It was a structure made up of something soft, pliable, piled up on a lower flat surface. It looked like a cocoon, laid flat.

Did the Ur-humans *sleep*?

Again Hork was pointing. ‘On top of that surface before the chairs. See? Instruments, built for giant hands.’

Dura saw a cylinder longer than a Crust-tree trunk. Its end was sharp, protruding over the lip of the surface. Perhaps it was a stylus, as she’d seen Deni Maxx use in the Hospital. She tried to imagine the hand that could grasp a tree trunk and use it to write notes ... Beside the ‘stylus’ there was another cylinder, but this was set upright. It seemed to be hollow - the

cylinder was transparent to Dura's eyes, and she could make out a structure of thick walls surrounding an empty space - and there was no upper surface.

She frowned and pointed out the second cylinder to Hork. 'What do you think that is? It looks like a fortress. Perhaps the Ur-humans needed to shelter - perhaps they came under attack ...'

He was laughing at her, not unkindly. 'No, Dura. You've lost the scale. Look at it again. It's maybe - what? - ten thousand mansheights tall?'

'Ten times as big as your glorious Parz City.'

'Maybe, but that's still only ten centimetres or so. Dura, the Ur-humans were *metres* tall. The *hand* of an Ur-human could have engulfed that cylinder.' He was watching her slyly. 'Do you see it yet? Dura, that's a food vessel. A cup.'

She stared. A cup, large enough to hold a dozen Parz Cities?

She tried to keep thinking. 'Well,' she said, 'then it's a damn odd cup. All the food would float out of the top. Wouldn't it?'

Hork nodded grudgingly. 'You'd think so.' He sighed. 'But then, there are many things about the Ur-humans we can't understand.'

She imagined this little box of Mantle-stuff from the outside. 'It's as if they created this inner chamber, around the wormhole Interface, as an ornament. A little section of the Star, so they could study Human Beings. We would look like toys to them,' she murmured. 'Less than toys; little animals, perhaps below the level of visibility.' She looked at her hand. 'They were a hundred thousand times taller than us; even the "Pig" would have been no more than a mote in the palm of an Ur-human child . . .' She shivered. 'Do you think any of them are still here?' She imagined a giant Ur-form floating in through some half-seen door, a face wider than a day's journey billowing down towards her . . .

'No,' Hork said briskly. 'No, I don't. They've gone.'

She frowned. 'How do you know?'

He grinned. 'For one thing, that's what your precious legends tell us. But the clincher is this seat.' He patted its arms. 'The Ur-humans set up this place so that *we* could work their machines. If I move the chair I can mimic anything an Ur-human could have done . . . Dura, they have made me as powerful as any of them. Do you see?' He probed at the unyielding surface of the chair. 'If we had the wit we could operate other devices.' He looked

around the ghostly chamber greedily. ‘There must be wonders here. Weapons we’ve never dreamed of.’

The Ur-humans had meant Star people to come here, to work the devices they left behind, maybe when the Glitches got too bad. Perhaps there was something they were meant to do now . . . But what?

‘Your arrow device doesn’t have an analogue, in the Ur-human chair,’ she said slowly, pointing up. ‘See? So the arrow-thing must be something meant for us alone. Maybe to help us see what’s going on.’ She frowned. ‘It only turned one quarter. What if you turned it again?’

‘Only one way to find out.’

He reached for the arrow.

At first he turned it back towards the darkest sector of the scale. Reassuringly the walls of smooth grey material congealed around them, shutting out the chamber of the Ur-humans. And when Hork twisted the arrow the other way the walls vanished, to reveal the vast devices.

‘All right,’ he said. ‘Going from the black to the dark grey allows us to see a little more. A little further. And what if I turn it another quarter, to the light grey?’

Dura shrank back despite herself. ‘Just turn it,’ she said hoarsely.

Confidently he twisted the arrow to the third of the four quarters.

Light seemed to bleed out of the Air.

The devices of the Ur-humans, the walls of their ghostly chamber, became still more translucent. And there was darkness beyond those distant walls, darkness which settled on the two humans, huddled as they were within layers of immensity.

Points of light hung in that darkness.

Dura twisted in the Air, staring around. ‘I don’t understand. I can’t see the walls of the next chamber. And what are those lights?’

‘There are no more walls,’ Hork said gently. ‘Don’t you see? No more chambers. *We’re looking out into space*, Dura, at volumes even the Ur-humans couldn’t enclose.’

She found her hand creeping into his. ‘And those lights . . .’

‘You know what they are, Dura. They’re *stars*. Stars and planets.’

‘Wake up, Bzya, you useless asshole.’

Hosch was slapping him. Bzya shook his head, blinking to clear his eye. He was surprised to be alive; the Bell should have imploded.

His bad eyecup blazed with pain. He raised a tentative fingertip to it to find the cup filled with sticky matter. His back ached, right at the base, where it had been bent backwards against the curve of the Bell.

‘So we’re not dead,’ he said.

Hosch grinned, his thin face drawn tight with fear. ‘We aren’t that deep in the underMantle. We can’t be, or the Bell would have collapsed already.’ He was kicking at the rim of the hatch frame, trying to splinter it with his heel.

Bzya flexed his hands and toes. He felt a vague disappointment. Fishing wasn’t the safest of occupations; he’d always known it would finish him one day. But not today - not so close to home, and after such a futile, wasted dive. ‘You’ll make the hatch collapse in if you keep that up.’

‘That’s . . .’ Kick. ‘ ... the idea.’ Kick. Kick.

‘And what then? Wave for it?’

‘You’ve got it.’ Kick, kick. ‘We’ve lost the cable. We haven’t any better options.’ The frame was already starting to splinter. The hatch was a disc of wood, held in place by external pressure against the flanged frame. Once Hosch damaged enough of the flange, the hatch would fall in easily.

Bzya glanced out of the window. ‘We’re not deep enough to crush the Bell, but we’re surely too deep for *us*. No one’s ever come so deep unaided. We must still be ninety centimetres.’

‘Then we’ll become damn legends. Unless you’ve a better idea, you useless jetfart. Help me ...’

But Bzya didn’t need to.

With a thousand tiny explosions all around the frame the flange splintered. Bits of wood rattled across the cabin; they flew into Bzya’s face and he batted at them dimly. Then the hatch fell forward, yielding in a moment. Bzya had an instant’s impression of a mass of fluid - dense, amber and incompressible - crowding into the breached cabin.

The wood-lamps died, overwhelmed.

Then it was on him.

It washed over his limbs, forced its way into his mouth and throat and eyecups; it was a hard physical invasion, like fists pushing into him. He could not see, hear or taste anything. He panicked, and twisted his head back and forth, trying to spew the vile stuff out of his lungs. But he could

not expel it, of course; he was embedded in this dense, unlivable material - in a layer of it ninety centimetres deep.

His lungs expanded, tearing at the material.

. . . And they found *Air*. Fragments, splinters of Air which stung as they forced their way out of his lungs and into his capillaries. His chest heaved, dragging at the fluid around him. There *was* Air here, but with just a trace of its normal fractional density.

Damn it, maybe I can make it out of this . . .

Then the burning started.

It was all over his body, like a thousand needles. And inside him too - *by the Wheel!* - scorching into his lungs and stomach; it flooded the capillaries that coursed through his body, turning the network of fine tubes that permeated him into a mass of pain, every threadlike capillary electric-alive with it.

Too dense. Too dense . . .

In these extremes of density and pressure the tin nuclei at the surfaces of his body were seeking a new stable configuration. The nuclei were breaking apart from each other and crumbling into their component nucleons, which were then swarming into the fire-Air in search of the single, huge nucleus which filled the heart of the Star ... Bzya was dissolving.

He kicked at the fluid, driving his legs through it. He felt a dull impact as his head struck something. It must be the wall of the Bell. He felt vaguely surprised to find that there was anything left of the familiar, external universe, beyond this pain-realm of dissolution. But he'd managed to move himself. He'd *Waved.*

He dragged his hand through the fluid, made a sign of the Wheel against his chest. He couldn't see, but he could breathe, and he could Wave. He was going to get out of here.

He'd bumped his upper face. He must be facing the rear wall of the cabin, then; he must have been spun around by the incoming underMantle fluid. He turned round, spread his hands behind him across the wall. The pain eclipsed his touch, but he could feel the curve of the wall, the round profile of a window. He pictured the cabin, as it had been in that last instant before the hatch came in. Hosch had been somewhere to his right.

He pushed away from the wall and Waved that way, groping ahead of him.

His hands found something. Hosch, it had to be. He ran his hands over Hosch's chest and head; Hosch didn't respond. Hosch's skin crumbled under Bzya's touch - or maybe it was the flesh of Bzya's own fingers and palms.

He found Hosch's hand, wrapped it in his own.

Two strong kicks and he'd found the open hatchway. He was still blind, and his sense of touch was fading - perhaps, he thought with horror, it would never return; even if he survived perhaps he would have to live in this shell of pain, without light or sound ... But he could feel the rim of the hatchway, the splinters left by Hosch's brave kicking.

He tried to fall forward, out of the Bell, but something was holding him back. Something hard, unyielding, which pressed into his chest and legs - the Corestuff hoops, wrapped around the Bell. He lifted his feet against the lower hoop, grabbed the upper with a numbing hand, and tried to straighten his body. His lower back, already injured, blazed with pain. He felt an abrupt shift as the hoops slid apart. He lifted his feet and let his body slide forward through the gap; he held his hands over his head and felt the limp form of Hosch rattle against the hoops, following him.

He tumbled out of the Bell, dragging the supervisor after him.

He had to find the Spine. He turned to his left and kicked out. He held Hosch's hand tight - at least he thought he did; only pain reached him now from his hands, feet and face. He felt a whispering drag pull at his own body ... No, he thought, it was more than that; there were a thousand discrete tugs at his flesh, like hooks dragging into the skin. His flesh was *ablating*, he realized slowly, crumbling off him as he Waved.

He reached ahead with his free hand. His sight was gone, both eyecups useless now. This was the way back to the Spine, as best he remembered it from the moment the Bell had been torn away by the Magfield surges. Of course, since then he'd been unconscious. The Bell could even have turned upside down . . .

But he didn't have any better guesses. He thrashed at the scouring liquid, trying not to estimate how far he'd Waved from the Bell, how much further before he was *sure* he'd missed the Spine.

Mercifully the pain seemed to be lessening. The burning, the decomposition of his flesh, must be damaging the nerve endings themselves. Soon he genuinely would be isolated inside his body.

Well, I'll never Surf again. Or sculpt. Or, and now his inner smile faded, *or feel a woman's skin.*

There was a new stab of pain from his outstretched arm, his useless stub of hand. The arm buckled, forced back by something solid.

His body collided with a hard surface. He tried to feel with his chest, thighs and face.

The Spine. The blessed Spine.

He dragged his free arm across the surface until it snagged on something. There, he had it - a Bell cable. He made his hand into a hook and wrapped it around the cable. With Hosch still towed limply behind him, he flattened himself against the wooden surface of the Spine, and began to Wave once more, along the length of the Spine, using the Cable as a guide.

How ironic, he thought, if he were Waving the wrong way, down towards the Core.

By the time he was lifted out of the fluid, he was almost isolated from the world, inside a deadened body. He felt as aware, as alert as ever, but he could feel little. Even the pain had gone now. But he could feel his chest expand, dragging in the thinning, clearing Air, and he could feel the Magfield pull at his stomach, the centre of him.

He was still here, he thought. Just a little battered around the edges.

He thought he'd kept Waving until the end, and he thought he'd kept hold of Hosch. But it was hard to be sure.

And now he was being moved again, more delicately. He tried to smile. The Fishermen must have come down for him and Hosch, in a second Bell.

He was glad he couldn't see the looks on their faces, as they nursed him.

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25

With a final heave from the team of volunteers, the patient was loaded through the kicked-out Hospital wall and into the car waiting in the Air beyond. Adda watched the car recede cautiously from the Hospital, and then turn to join the streams of refugees fleeing to the upflux.

Once the evacuation of the City had begun, this ward of the Hospital of the Common Good, directly behind the Skin of Parz, had rapidly been adapted to serve as a loading bay. Now it was a three-dimensional swarm of Hospital staff, volunteers, patients and those close to them. Patients screamed or moaned, and staff called desperately to each other for splints, bandages, drugs. And as fast as the patients were shipped off in the cars outside, more - ever more - were crowding in from the rest of the broken City. Adda felt overwhelmed, daunted, dismayed, exhausted. *Perhaps I've finally seen too many changes. Too many disasters; too many shattered bodies . . .*

He leaned out into the Air beyond the Skin. He opened his mouth, trying to expel from his lungs the Hospital stink of stale capillary-Air. But even outside the Skin the Air was sour; he could smell nuclear-burning wood, Air-pig jetfarts, the smell of human fear. It was as if the City, in its death throes, was wrapped in an invisible cloud of sour-smelling photons, like an immense dying creature leaking its last capillary-Air.

The City, suffering hugely with groans of wood and the shearing scream of failing Corestuff metal, shuddered around him. The Hospital was lodged in the Downside belly of the City, so that Adda was peering out of the Skin like an insect gazing out of a wall. The anchor-bands were still functioning; electron gas shone around them in response to the huge currents surging through their superconducting interiors as the City fought to maintain its position.

The Skin was a blur of motion. All over the City the fragile hull had been kicked away. People clambered out of the City and into waiting cars; most of them dragged possessions after them through the ragged holes they'd made. Cars and free-Waving people diffused away from the City in a widening, blurring cloud. The Air was filled with the yells of people, the braying commands of Speakers.

Beyond the pathetic human river the Glitch-wracked vortex lines were mere sketches, scribbles of instability. The Magfield shuddered perceptibly as the massive upwellings from the Quantum Sea continued.

And in the far distance, the blue-violet fire of Xeelee ships raked through the Mantle. It was a sight he never thought he'd live to see.

'Adda!'

Reluctantly, he turned away from the open Air and concentrated on the ward once more.

The next patient to be evacuated, a woman, was screaming in pain. She was so swaddled in stained bandages that all that could be seen of her was a gaping mouth. Deni Maxx trailed after this grotesque package, stroking the woman's hair and murmuring futile words of comfort. Deni looked to Adda with a mute appeal. He tried to mask his reluctance to touch the injured woman. He moved closer to the woman and stared into her face, muttering gruff, calming words. It was like soothing a wounded Air-pig. But the woman's eyecups were black with bruising, and he doubted that she'd heard him.

They moved quickly to load the woman into a waiting Air-car. At last the car pulled away from the building, and the screams of the woman dwindled slowly.

Deni lingered by the improvised doorway and gulped in breaths of dank Polar Air. She looked into the mists of distance, at the violet limbs of the Xeelee starbreaker beams walking easily through the Star.

'Let's hope those damn things keep away from the City,' Adda said.

She brushed back a handful of filthy hair. 'And from your people, wherever they are . . . Anyway, if the beams do hit us directly, it will be mischance. The purpose of the Xeelee is obviously to disrupt the Core; they wouldn't waste effort on a tiny, helpless construct like a City.'

'Yes. So much for Hork's expedition into the underMantle.'

'Perhaps. But, Adda, that brave and foolish expedition was the only hope any of us had. I have clung to it far beyond any rational point.' She smiled thinly. 'In fact I still cling to it. Why not? As long as it keeps me functioning.'

He surveyed the thin trails of Air-cars and people dispersing into the roiling Air. In the distance the larger cars showed up as silhouettes, fleeing insects against searing Xeelee light.

Deni rubbed her chin. ‘You may not understand this, Adda, but most of the City’s people have never strayed outside Parz before. To them, the City has always been the safest place in the world. Now that it’s falling apart around them, they feel - betrayed. Like a child abandoned by its parents.’ She hesitated. ‘We’re talking of hope. But in a way, for many the worst has already come to pass.’

‘Do you think we’re doing any good here?’

She looked strained. ‘Well, we’re shoving the patients out of this improvised port as fast as they are coming in - crushed in the Stadium, or burned and sliced open by that Corestuff berg incursion through the Midside . . . But whether they are any safer out there than in what’s left of the City, I don’t care to judge.’ She smiled without humour. ‘But at least it makes us feel better to help them. Don’t you agree?’

Another patient was shouldered past them and out into a waiting car. Farr was in this latest work party, and as soon as the patient - an unconscious child - was delivered, Farr turned to make his way back into the chaos of the ward. Adda laid a hand on his shoulder, restraining him. There were deep bruises around the boy’s eyes; his shoulders were hunched and his mouth was working as if he was mumbling to himself.

Adda shook him gently. ‘Farr? Are you all right, lad?’

Farr focused on the old man. ‘I’m fine,’ he said, his voice high and thin. ‘I’m just a little tired, and . . .’

‘Listen, you don’t have to carry on with this.’

Farr looked offended. ‘Adda, I’m not a kid.’

‘I’m not suggesting you are, you damn . . .’

Deni moved smoothly between them, something of her old sheen of competence returning to her. ‘Farr, you’re doing a marvellous job . . . and I need you to keep on doing it. So I agree with Adda; I think you should take a short break - find something to eat, a place to rest.’

Farr looked ready to protest further, but Deni pushed him gently in the chest. ‘Go on. That’s an order.’

With a thin smile the boy complied.

Deni turned a quizzical face to Adda. ‘I can tell you were never a parent.’

Adda growled wordlessly.

A new Air-car approached the rough lip of the opened-up wall; five nervous pigs jostled together, bumping against the Skin like inflated toys. The car's door opened and the driver leaned across. 'Adda,' Toba Mixxax said, his broad, weary face splitting into a grin. 'I'm glad to find you. Ito said you were trying to get here, with Farr.'

'Well, he's here. He's fine. He's working hard.' Adda had always found Toba's round, flat face rather bland and unexpressive; but now Adda could see real pain in the set of Toba's eyecups, the small lines at the corners of his mouth. 'Cris isn't here. I'm sorry.'

Toba's expression barely changed, but Adda could see a small light go out of him. 'No. I, ah - I didn't expect he would be.'

'No.'

The two men let their gazes slide away from each other, briefly embarrassed.

'How's Ito? Where is she?'

'At the ceiling-farm. What's left of it. She's found plenty to do. She's a craftswoman, Adda, and she's launched herself into repair work, with the coolies who've stayed.' He shook his head. 'Everything's smashed, though. You wouldn't believe it.' There was bitterness in Toba's voice. 'This latest Glitch has done for us, Adda.'

Toba's words made him think of what Deni had said - that the Xeelee were here to disrupt the Core, to devastate *the Star itself*. Adda wasn't very imaginative; he focused on the here-and-now, on what was achievable. But, he suddenly wondered, what if Deni Maxx was right - that the Xeelee truly had come, this time, to finish the Star - to do for them all?

He glanced around the lurid sky. Inside himself, he'd been expecting this Glitch to come to an end, eventually - just like all the other Glitches in his long life, no matter how severe. But what if that wasn't true, this time? After all, the Xeelee were *manufacturing* this Glitch; his previous experience wasn't a reliable guide. What if the Xeelee kept on, persisted until the Core itself welled out from rents in the Quantum Sea . . .

Up to now Adda had been anticipating only his own death, and the death of many others - even of those close to him. But perhaps this new catastrophe was destined to go much further - to encompass the destruction of the race itself. He was overwhelmed suddenly by a vision of the Star

scoured clean of Human Beings, of all future generations - everything Adda had worked for - snuffed out, rendered meaningless.

Toba was still talking. Adda hadn't heard a word he'd said for a long time.

Adda pulled himself away and took a deep breath. If the world was to finish today - well, there was little Adda could do about it. In the meantime he had work to do.

Deni Maxx joined Adda in the improvised doorway. 'Thanks for coming to help us, citizen.'

Toba shrugged. 'I needed something to keep me busy.' Another patient was being brought through the ward now; Toba Mixxax stared past Adda at the broken body, and his round face set into a mask of grimness.

'Well, you found it,' Adda said darkly.

Deni Maxx touched his arm. 'Come on, upfluxer. Let's get back to work.'

In the distance the starbreakers, like immense daggers, continued to pierce the Mantle. Adda stared out for one moment longer; then, with a final nod to Toba, he turned away.

Once the Star had seemed huge to her. Now here she was stranded in the immensity of this Ur-sky, of stars and planets, and she thought back almost nostalgically to the cosy world of the Mantle - with the smooth purple floor of the Quantum Sea below her, the Crust a blanket above her, the Mantle itself like an immense womb succouring her. All of that had been stripped away by this astonishing journey, and by the seeing-gadgets of the Ur-humans.

She tilted back her head and opened her eyes as wide as she could, trying to take it all in, to bury her awe and build a model of this new universe in her head.

The sky around them - the space between the stars - wasn't utterly black. She made out hints of structure: clouds, whorls, shadings of grey. There must be some kind of air out there, beyond the transparent walls - air but not Air: thin, translucent, patchy, but sufficient to give the sky an elusive shape. It was a little like the fugitive ghost-patterns she could see in the darkness of her own eyecups if she jammed her eyes tight shut.

And beyond the thin shroud of gas lay the stars, suspended all around the sky. They were lanterns, clear and without flicker; they were of all

colours and all levels of brightness, from the faintest spark to intense, noble flames. And perhaps, she thought with an almost religious awe, those lights in the sky were worlds in themselves. Maybe there were other forms of humans on those distant lights, placed there by the Ur- humans for their own inscrutable purposes. Would it ever be possible to know? - to speak to those humans, to travel there across such immensities?

She tried to make out patterns in the distribution of the stars. Perhaps there was a hint of a ring structure over there - and a dozen stars trailed in a line across that corner of the sky . . .

But as fast as she found such bits of orderliness in the unmanageable sky, she lost them again. Slowly she came to accept the truth - that *there was no order*, that the stars were scattered over the sky at random.

For the first time since leaving the 'Flying Pig', panic spurted in her. Her breath scraped through her throat and she felt her capillaries expand throughout her flesh, admitting more strength-bearing Air.

Why should randomness upset her so? Because, she realized slowly, there were no vortex lines here, no neat Crust ceiling or Sea floor. All her life had been spent in a ruled-off sky - a sky where any hint of irregularity was so unusual as to be a sign of deadly danger.

But there were no lines here, no reassuring anchor-points for her mind.

'Are you all right?' Hork sounded calmer than she was, but his eyecups were wide and his nostrils flared, glowing like nuclear-burning wood above his bush of beard.

'No. Not really. I'm not sure I can accept all this.'

'I know. I know.' Hork lifted up his face. In the starlight the intrinsic coarseness of his features seemed to melt away, leaving a calm, almost elegiac expression. He waved a hand across the sky. 'Look at the stars. Look how their brightness varies . . . But what if that variation is an illusion? Have you thought about that? What if all the stars are about as bright as each other?'

Her mind - as usual - plodded slowly behind his flight of logic. If the stars were all the same intrinsic brightness, then some of them would have to be further away. Much further away.

She sighed. No, damn it. She *hadn't* thought of that.

Somehow she'd been picturing the starry Ur-universe as a shell around her - like the Crust, though much further away. But it wasn't like that; she

was surrounded by an unbounded sky throughout which the stars - themselves worlds - were scattered like spin-spider eggs.

The universe ballooned around her, reducing her to a meaningless mote, a spark of awareness. It was oppressive, beyond her imagination; she cried out, covering her face in her hands.

Hork sounded uncomfortable. ‘Take it easy.’

Irritation burrowed through her awe. ‘Oh, sure. And you’re quite calm, I suppose. Sorry to embarrass you . . .’

‘Give me a break.’

She turned away from him, striving for calm. ‘I wish I knew what is an appropriate response to all this - to be here in this ancient place, to be seeing through the eyes of the Ur-humans . . .’

‘Well, not quite,’ Hork said gently. ‘Remember there are still walls around us, which must somehow be helping us to see. The Ur-humans didn’t see things the same way we do. Ask Muub about it when we get back . . . We “see” by sound waves which are transmitted through the Air.’ He waved a hand. ‘But beyond this little bubble, there isn’t any Air. The Ur-humans didn’t live in Air, in fact. And they “saw” by focusing beams of photons, which . . .’

She wrinkled her nose. ‘They could *smell* the stars?’

‘Of course not,’ he snapped. ‘In Air, photons can travel only slowly, diffusing. So we use them to smell. And we “hear” temperature fluctuations.

‘In empty space, it’s different. Phonons can’t travel at all - so we would be blind. But photons travel immensely fast. So the Ur-humans could have “seen” photons . . . Anyway, that’s Muub’s theory.’

‘Then how did they hear? Or smell, or taste?’

He growled impatiently. ‘How the hell should I know? Anyway, I think this third chamber is designed to let us see the universe the way the Ur-humans did.’ He rubbed his chin thoughtfully. ‘And there’s still a setting left on the arrow-console, the fourth one . . . we haven’t finished with our ways of seeing yet.’

She’d forgotten about that last setting. Some core of her, buried deep inside, quailed a little further.

Turning in the Air she looked around, still searching for patterns. The sky wasn’t uniformly dark, she realized; the elusive gas faded up from grey

to a deep, crimson glow on the far side of the room. ‘Come on. I think there’s something beyond the wormhole chamber . . .’

Still holding hands, they Waved past the control chair and around the darkened tetrahedron which contained the wormhole portal and the ‘Pig’. Through the open door, Dura glimpsed their craft; its roughly hewn wooden walls, its bands of Corestuff, the slowly leaking stink of Air-pig farts, all seemed unbearably primitive in this chamber of Ur-human miracles.

The sky-glow intensified as they neared its source. At last the glow drowned out the stars. Dura felt herself pull back, shying away from new revelations. But Hork enclosed her fingers in a tight, smothering grip and coaxed her forward. ‘Come on,’ he said grimly. ‘Don’t fold on me now.’ At the centre of the glowing sky was a single star: tiny, fierce and yellow-red, brighter than any other in the sky. But this star wasn’t isolated in space. A ring of some glowing gas circled the star, and - still more astonishing - an immense globe of light hung close to the fierce little star. The globe was like a star itself, but attenuated, bloated, its outer layers so diffuse as almost to merge with the all-pervading gas cloud. Tendrils of grey light snaked from the globe-star and reached far into the ring of gas.

It was like a huge sculpture of gas and light, Dura thought. She was stunned by the spectacle, and yet charmed by its proportion, scale, depths of shading and colour.

She was seeing the gas ring around the star from edge-on . . . in fact, she realized slowly, the Ur-human construct around her was actually *inside* the body of the ring. And she could see beyond the central star to the far side of the gas ring; distance reduced the ring’s far limb to a line of light on which the little star was threaded, like a pendant.

She could see turbulence in the ring, huge cells big enough to swallow a thousand of the Ur-human colonies. The cells erupted and merged, changing as she watched despite their unthinkable scale. And there seemed to be movement around the star, a handful of sparks dipping into its carcass . . .

‘Then it’s true,’ Hork breathed.

‘What?’

‘That we’re not in the Star any more. That we’ve been transported, through the wormhole, to a planet outside it.’ Ring- light bathed his face, casting complex highlights from his beard. ‘Don’t you see? That’s our star -

the Star - and, just like the map said, we're on a planet circling the Star. But the map didn't show the ring.' He turned to her, excitement in his eyes. It was the excitement of understanding, she realized, of piecing together a puzzle. 'So now we know how our Star's system is put together.' He mimed with his hands. 'Here's the Star, at the centre of it all. The gas ring encircles it, like this. The planet must drift within the ring. And hanging above it all we have the globe-thing, glowing dully and leaking gas.'

Dura stared at their Star. It was small and mean, she thought, disappointing compared to the glorious lanterns which glittered in other parts of the sky. And yet it was *home;* she felt a strange dislocation, a pang of sadness, of loss. 'Our world is so limited,' she said slowly. 'How could we ever have known that beyond the Crust was so much wonder, immensity, beauty . . .'

'You know, I think that big sphere of gas has a glow of its own. It isn't just reflecting the Starlight, I mean.'

The globe was like an immense pendant on the ring, utterly dwarfing the Star itself. Hork seemed to be right; the intensity of its grey-yellow glow increased towards its rough centre. And it wasn't actually a sphere, she realized slowly; perhaps it had once been, but now it was drawn out into a teardrop shape, with a thin tip attached to the ring by an umbilical of glowing gas. The outer layers of the globe were misty, turbulent; Dura could see through them to the darkness of space.

'It's like a star itself. But . . .'

'But it doesn't look right.' Dura searched for the right word. 'It seems - *unhealthy* .'

'Yes.' He pointed. 'It looks as if stuff is being drawn out of the big star and put into the ring.' He glanced speculatively at Dura. 'Perhaps, somehow, the Star is drawing flesh from the big star to create the ring. Perhaps the planet we're on is constructed of ring-stuff.'

She shuddered. 'You make the Star sound like a living thing. Like an eye-leech. '

'A star-leech. Well, perhaps that's as good an explanation as we'll ever get . . .' He grinned at her, his face spectral in the ring's glow. 'Come on. I want to try the arrow's last setting.'

'Oh, Hork . . . Do you have *any* capacity for awe?'

‘No.’ His grin broadened through his beard. ‘I think it’s a survival characteristic. Mental toughness, I call it.’ He led her back around the inner portal-chamber and eyed her roguishly. ‘So we’ve seen the stars. Big deal. What’s left?’ ‘Twist the arrow and find out.’

He did so.

The universe - of stars and starlight - imploded.

Dura screamed.

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26

The stars - all except *the* Star - had disappeared, dragging all the light from the sky. The Star, with its ring and its huge, bleeding companion, hung in an emptied sky . . .

No, she realized, that wasn't quite true. There was a bow around the sky - a multicoloured ribbon, thin and perfect, which hooped around the Ur-humans' habitat - and, she saw, passed *behind the Star itself.*

It was a ribbon which encircled the universe, and it contained all the starlight.

Hork loomed before her, the starbow adding highlights to the grey illumination of his face. 'Well?' he demanded irritably. 'What now?'

She rubbed her forehead. 'Each setting of that device has shown us more of our surroundings - more of the universe. It's as if successive layers, veils, have been removed from our eyes.'

'Right.' He lifted his eyes to the starbow. 'So this must be the truth? The last setting, which strips away all the veils?' He shook his head. 'But what does it mean?'

'The sky we saw before - of stars, scattered around the sky - was strange to us . . . even awesome. But it looked *natural*. The stars were just like our Star, only much further away.'

'Yes. Whereas this seems distorted. And how come we can still see our Star? Why isn't its light smeared out into this absurd hoop, too?'

Smeared starlight . . . Yes. I like that. Good; that's very perceptive . . .

Dura whirled in the Air, trying to suppress a scream. The voice, dry and soft, emanating from the emptiness of the huge room behind her had been utterly terrifying.

'Karen Macrae,' Hork said, his voice thick with hostility.

A sketch of shoulders and head wrought in pale, coloured cubes of light hung in the Air a mansheight from them. The definition was poorer than within the underMantle - the colours washed out, the jostling light-cubes bigger. Karen Macrae opened her eyes, and again Dura was repulsed by the fleshy balls nestling within the cups.

Hork had been right; somehow Karen Macrae had ridden with them in the lump of Corestuff attached to the side of the 'Pig', all the way from the depths of the Star to this remote, austere place.

The starlight is smeared; yes. And it's crucial that you understand why it's smeared, what's happening to you. The walls of this place aren't windows; they have processing capacity - they're virtually semi-sentient, actually - capable of deconvolving the Doppler distortions of . . .

Hork growled and Waved forward. 'Talk straight, damn you.'

The blurred head rotated slowly. *Doppler distortion. Blue shift. You - we - are travelling enormously quickly through space. Almost as fast as light itself. Do you see? And so . . .*

'And so we outrun starlight,' Hork said. ' . . . I think I understand. But why is it we still see the Star itself, and its system of ring and giant companion?'

The Colonist seemed to be retreating into her own half-formed head; the fleshy things in her eyecups slid around like independent animals.

Dura struggled to answer Hork. 'Because the Star is travelling with us. And that's why we can still see its light.' She looked at him doubtfully. 'Does that make sense?'

Hork growled. 'This Colonist and her riddle-talk . . . All right. Let's assume you're right. After all, we haven't any better explanation. Let's assume we, and the Star, are travelling through space as fast as light. *Why?* Where are we coming from? And where are we going?'

There was no answer from Karen Macrae. Light-cubes crawled over her face like leeches.

Hork and Dura stared at each other, as if seeking the answers in each other's exasperated faces.

They looked around once more, trying to make sense of the distorted sky. Dura felt small, fragile, helpless in this ensemble of hurtling worlds. There was a symmetry to the smeared light around them, and after some argument they decided that their departure point and destination must lie at the poles of an imaginary globe around them, the globe whose equator was marked by the starbow.

Hork reached for the arrow device. 'All right. Then let's see if we can see what lies there . . .' He set the pointer at its penultimate setting.

The stars fled from the crumbling starbow and back to their scattered homes around the sky.

Hork Waved towards one of the imagined poles, peering through the blocky Ur-human cloud devices and into space. To Dura, who remained

close to Karen Macrae, he looked like a toy, a speck swimming against the Ur-humans' vague immensities.

'Nothing here,' he called at last, sounding disappointed. 'Just an anonymous patch of stars.'

'Then it must be at the other end of the chamber. The other pole. Come on.'

She waited for him to return. Then, hand in hand, they Waved in the Star's direction of flight.

. . . And there *was* something at the pole of the sky: something set against the backdrop of stars, something huge - if diminished by distance - and precisely defined.

Karen Macrae was saying something. The rustling words sighed across the huge silences of the chamber.

Dura and Hork hurried back and pressed their faces close to the Colonist's cloudy lips. 'What is it?' Dura demanded, almost despairing. 'Won't you try again? What are you saying to us?'

. . . The Ring. Can you see it? I've so little processing power here . . . hard to . . . the Ring . . .

Dura turned away and looked at the artifact; and a fear borne of childhood tales, of old, distorted legends, welled up in her.

The car sailed away.

Adda hung on to the ward's improvised doorframe and sucked Air into his lungs. He glanced around the sky. The panorama, now sombre and deep yellow, grew less and less like the secure, orderly Mantlescape he'd grown old with: the vortex lines were discontinuous shreds of spin loops struggling to reform, and the starbreaker beams continued to cut down through the Air and into the Core, unnaturally vertical.

Tired as he was, something probed at the edge of his awareness. It seemed *darker* than before. Why should that be? He pushed himself out of the ward and Waved a few weary mansheights into the sky. Behind him, the Skin was a limitless wooden wall which cut away half of the sky. It was bounded about by the huge anchor-bands and punctuated by a hundred crude gashes; a slowing trickle of cars and people still dribbled from the opened-up walls and diffused into the wastes of the Air. The Skin was dark, intimidating . . .

Too dark. That was it.

Adda Waved a little further and twisted his head around, surveying the Corestuff anchor-bands. The huge hoops were like a grey cage over the City's wooden face - but they were dull, lifeless, where a little earlier they had crackled, with blue electron gas.

The glow of the gas had gone.

So the dynamos, the huge, wood-burning lungs of the City, had failed at last. Perhaps they had been abandoned by their attendants; or maybe some essential part of the City's infrastructure had failed under the strain of holding the City against the fluctuating Magfield.

It scarcely mattered.

There was a sharp explosion. A hail of splinters fanned out from the base of the City, at the junction of the Spine and the main inhabited section. The splinters sailed away through the showers of sewage material still falling from the base of Parz.

There might be no more than heartbeats left.

Adda Waved strongly back to the improvised Hospital port and dived into the melee of swaddled patients, harassed staff and volunteers. He found Farr helping Deni Maxx to fix a patient's bandages. He grabbed Farr's and Deni's arms roughly; he hauled them away from the unconscious patient and towards the exit.

'We've got to get out of here.'

Deni stared at him, the deep yellow Air-light scouring shadow-lines in her face. 'What is it? I don't understand.'

'The anchor-bands have lost power,' Adda hissed. 'They can't sustain the City, here above the Pole. The City's going to drift - come under intense stress . . . We have to get away from here. The City will never withstand it . . .'

Farr glanced back to the patients and helpers. 'But we're not finished.'

'Farr,' Adda said with all the persuasiveness he could muster, '*it's over*. You've done a marvellous job, but there's nothing more you can do. Once the effects of the band failure hit we won't be able to complete the evacuation anyway.'

Deni Maxx stared into his face, her mouth tight. 'I'm not leaving.'

Adda felt his scarred old heart break once more.

'But you'll die,' he said, hearing a plea in his voice. 'These wretched people can never survive anyway. There's no point . . .'

She pulled her arm from his grasp. She looked back into the ward, as if all this had been a mere distraction from her work.

When he placed his hand on the crude doorframe he felt a deep, shuddering vibration, coming from the very bones of the City, and shivers of turbulence crept across the bare skin of his arms and neck.

Maybe it was already too late. He pulled himself through the improvised doorway and into the open Air.

He looked back into the ward. Deni Maxx was making her way back into the chaos of patients and helpers, her face set. Already she'd dismissed his warning. Forgotten it, probably. But Farr still lingered close to the doorway; he looked back into the ward, apparently torn.

Well, Deni was lost; but not Farr. Not yet.

Adda grabbed Farr by the hair and, with all his remaining strength, hauled the boy backwards out of the Hospital and hurled him into the Air. Farr came to rest in the empty Air, struggling; he looked like some stranded insect, dwarfed by the immense, wounded face of the City. He glared at Adda. 'You had no right to do that.'

'I know. I *know*. You'll just have to hate me, Farr. Now Wave, damn you; Wave as hard as you've ever Waved in your life!'

There was a glow from the North, a deep, ominous red glow from all around the sky. It was a light Adda had never seen before. It soaked the Mantle in a darkness in which the starbreakers of the Xeelee glowed like opened-up logs.

Another shout of tearing wood and failing Corestuff was wrenched from the guts of the City. The Skin *rippled;* waves perhaps a micron high spread over its surface, and the wood broke open in tiny explosions.

Adda dropped his head and kicked at the seething Air, Waving away from Parz as hard as he could.

The Ring was reduced by distance to a sparkling jewel, lovely and fragile.

'I believed most of it,' Dura said slowly, 'most of the stories my father told me . . . But I don't think I ever quite believed in the Ring itself.'

Bolder's Ring, the greatest engineering construct in the universe. So massive - rotating so rapidly - that it had ripped a hole in space itself.

'The Ring is a doorway in the universe, a way for the Xeelee to escape their unknown foe,' she told Hork.

His fists clenched; dwarfed by the huge sky around him, his belligerence looked absurd. ‘I know your legends. But what foe?’ He crowded close to Karen Macrae and drove his fist into the cloud of jostling cubes which comprised her face. His hand passed through, apparently unaffected. ‘What foe, damn you?’

Slowly Karen Macrae began to talk, the globes in her eyecups glinting. She spoke hesitantly, in fragments.

The Star was spawned in a *galaxy*, a disc of a hundred billion stars. It was actually ancient, the cooling remnant of an immense explosion which had driven away much of a massive star’s bulk and devastated the grey companion which still accompanied it. As time wore on the Star had drawn material from the companion, knitted gas into planets.

Then the Ur-humans came.

They downloaded the Colonists - images of themselves - into the Core; and the Colonists built the first Star-humans. For five centuries the Colonists and the Star-humans worked together. Huge engines - *discontinuity drives*, Karen called them - were built at the North Pole of the Star. Teams of Star-humans wielded mighty devices under the instruction of the Colonists.

Hork’s eyes narrowed. ‘Ah,’ he breathed. ‘So they *do* need us, these Colonists. We are the hands, the strong arms which built the world . . .’

The discontinuity drive engines hurled the Star from its birthplace. It soared out of its galaxy and sailed free across space.

The Ring was close to the Star’s native galaxy - so close that light would take no more than ten thousand years to cross the void to the Ring, Karen Macrae said; so close that the immense mass of the Ring was already distorting the galaxy’s structure, pulling it apart. The Star - with its companion, its planets and gas ring, and its precious freight of life - fell across space towards the Ring, glowing in the darkness like a wood-burning torch.

A century passed inside the Star. Thousands of years fluttered by in the universe outside the Crust. (Dura could make nothing of this.)

The Ring neared.

The Colonists grew afraid. The Star-humans grew afraid. ‘Why?’ Dura demanded. ‘Why should they fear the Ring? What will happen when we reach it?’

The Colonists retreated into the Core. They had constructed a wonderful virtual world for themselves in there - unreal Earths . . . And they believed they would be safe there, that they could ride out any disaster which might befall the Star.

The Star-humans were left bereft in the Mantle like abandoned children. They had their wormholes and other gadgets, but without the guidance of the parent-Colonists the devices were like so many gaudy toys.

Resentment grew, displacing fear. The Star-humans determined that they would follow the Colonists into their Core haven if they could - or if not, they would make the complacent Colonists as fearful as themselves.

Wormhole Interfaces were ripped from their anchor-sites in the Mantle and hurled downwards into the Core. Armies, grim-faced, lanced through the wormholes in improvised ships. The technologies which had once built the discontinuity drives were pirated to craft immense weapons.

‘The Core Wars,’ Hork said slowly. ‘Then they really happened’

Hork’s anger was intense; it was as if, Dura thought, the huge injustice of abandonment had occurred only yesterday, not generations before.

The Colonists, insubstantial Core-ghosts as they were, had nevertheless retained immense material power. The War was brief.

Power failed; weapons exploded, or dissolved, killing their operators. The Interfaces were dragged into the Core, or fell into uselessness, their linking wormhole tunnels collapsed. Once the Mantle had sustained a single community of Star-humans, united by the wormhole network. In a few heartbeats that Star-wide culture collapsed.

Humans, naked, defenceless, fell into the Air.

A huge silence fell over the Star.

With the War ended, the Colonists retreated into the Core and prepared for eternal life.

Hork pounded his fist into his palm. ‘The bastards. The cowardly bastards. They abandoned us, to generations of suffering. Illness, disease, Glitches. But we showed them. We built Parz City, didn’t we? We survived. And now, five centuries after dumping us, they need us again . . .’

Dura couldn’t drag her eyes away from the Ring. Lights flickered over the huge construct, dancing silently. ‘What’s happening to the Ring? I don’t understand.’

Hork snorted. ‘Isn’t it obvious? The Ring is under attack. It’s a war, Dura; someone is attacking the Xeelee.’

He pointed at the incongruously delicate patterns of light. ‘And it would be too much of a coincidence for us to arrive here, aboard this Star, just as the first battle is being waged. Dura, this war - the assaults on the Ring - must have been enduring for a long time.’ He rubbed his chin. ‘Generations, perhaps; centuries of war . . .’

She felt a pulse pound in her throat. ‘Humans? Are they Ur-human ships?’ She stared at the tableau, willing herself to see more clearly, seeking the huge ships of those spectral giants.

The battle unfolded, slowly, even as she watched. Some of the sparkling ships disappeared, evidently destroyed by Xeelee defenders. Others plummeted through the Ring, she saw; and if the old stories were correct those ships were now lost in different universes. She wondered if the crews of those ships would survive . . . and if they did, what strange tales they would have to tell.

‘Oh, yes,’ Hork said grimly. ‘Yes, the assailants are humans. Ur-humans, anyway.’

‘How can you be so sure?’

‘Because the Star *is heading straight for the Ring*. Don’t you see it yet, Dura? The Star has been aimed at the Ring. We’re going to collide with it . . .’

Dura stared at the remote, twinkling battlefire. Was Hork right? ‘I don’t know how big the Ring is. Perhaps it’s bigger than the Star; perhaps it will survive. But surely the Star is going to be devastated.’

Hork raised his fists to his chest. ‘No wonder the Xeelee have been attacking the Star; they’re trying to destroy it before it gets to the Ring. Dura, the Star has been launched on this trajectory, straight at the Xeelee artifact, as a *missile*.’ His tone had become hushed, almost reverent. Dura looked at him curiously; his eyes were locked on the images of distant battle, evidently fascinated.

She wondered if he were still quite sane. The thought disturbed her.

So that is why we are here, she thought. *That’s the purpose of the whole project. The Colonists, the manufacture of Star-humans . . . That is the meaning, the purpose of my race. My life.*

We are expendable weapons manufacturers, serving a huge war beyond our comprehension.

And when the Star destroyed itself against the Ring - or was destroyed first, by the Xeelee starbreakers - then they would all die with it, their purpose fulfilled.

No.

The word was like a shout in the turmoil of her mind. She had to *do* something. Without allowing herself to think about the consequences, she Waved briskly across the chamber towards the floating control seat.

‘What are you doing? Dura, there’s nothing we can do here. We’re in the grip of immense forces; forces we barely understand. And . . .’

She took her place in the seat. Around her the ghostly Ur-human seat swivelled, trembling in response to her touch. She grasped the twin handles fixed to the seat’s arms.

A globe swelled into existence in the Air, fat and sullen red; a neat grid covered its surface, laid out like the anchor-bands around Parz City.

Dura, startled by this sudden apparition, lost her nerve; she screamed.

Hork laughed at her. His voice, thin and shrill, betrayed his own tension. ‘Damn it, Dura, you’ve just witnessed a battle, immense beyond our capacity to comprehend. You’ve learned that our world is doomed. And yet you’re scared by a simple conjuring trick like this!’

‘But what is it?’

The globe was about a mansheight across; it hovered just in front of the seat. ‘Isn’t it obvious?’ Hork snapped. ‘Take your hands off the levers.’ She did so; the globe persisted for a few seconds, then deflated gracelessly, finally disappearing. ‘It’s an aid,’ Hork said briskly. ‘Like . . .’ He gestured vaguely. ‘Like a window in an Air-car. An aid to a pilot.’

She tried to focus on this new puzzle. She glanced across the chamber and out at the Star, that scowling yellow-red speck at the centre of its immense setting of gas and light. ‘But that globe looked like the Star itself.’

Hork laughed, the shrill edge still present in his voice; his eyecups were wide with excitement. ‘Of course it did! Don’t you see? Dura, one is meant to *pilot the Star* with these wonderful levers . . .’

‘But that’s absurd,’ she protested. ‘How can a Star - a whole world - be driven, directed like one of your Air-cars?’

‘But, my dear, someone has *already done so*. The Star has been launched at the Ring, with deliberate intent. That we have found a device to do this is hardly a surprise. And this is a map-Star, to help you pilot a world . . .’

She grasped the handles again and the globe sprang into existence, wide, delicate and ominous. She gathered her scattered courage. ‘Hork, we can’t let our world be destroyed.’

He moved closer to her. His eyecups were wide and empty, his breathing shallow. He seemed huge. His hands were held away from his body. She closed her fingers tighter around the chair handles, watching, half-expecting him to lunge at her.

‘Dura, get out of the chair. For a thousand years our Star has crossed space. We have a duty to fulfil, a destiny.’

She shook her head. ‘You’ve lost yourself in this, Hork. In the glamour of it all . . . It’s not our battle.’

He frowned at her, his bearded face a ferocious mask. ‘If it wasn’t for the battle we wouldn’t even exist. Generations of humans have lived, died and suffered for this moment. This is the purpose of our race, its apotheosis! I see this now . . . How can a person like you take the fate of a world in your hands?’

‘But I can’t - *accept* - this. I’ve got to try something. We must try to save ourselves.’

Doubt - a kind of longing - spread across Hork’s broad face. ‘Then consider this. Suppose we’re right. Suppose our world really is a missile aimed at the Xeelee. Then - if it really is possible to aim the Star with this device - *why is the device here*?’

She was frightened of him - not just physically, but of this new, unexpected side of his character, this sell-immolating fanaticism.

‘Think,’ he demanded. ‘If you were the designer, the Ur-human who planned this fantastic mission, what would you intend the occupant of that seat to do, now, at the climax of the project?’

She hesitated, thinking. ‘It’s meant to be used to refine the trajectory. To direct the Star even more precisely at its goal.’

He threw his arms wide. ‘Exactly. Perhaps there are devices lying dormant here, messages instructing us - or whoever was planned to be here - how to do just that. And *what if we don’t, Dura*? What if we don’t

complete our mission? Perhaps the Ur-humans themselves will intervene, to punish our arrogance.'

Her palms were slick with sweat; his words were like the articulation of the conflict inside her. Who was she to decide the fate of a world, of generations?

She thought back over her life, the extraordinary, unfolding sequence of events that had led her to this point. Once, not a very large fraction of her life ago, she had been adrift in the Mantle, at the mercy of the smallest stray Glitch along with the rest of the Human Beings. Stage by stage, as events had taken her so far from her home, her understanding of the Mantle, the Star, and the role of mankind had opened out, like the layers of perception opened up gradually by the seeing-walls of this Ur-human construct.

And now she was here, with more power over events than any human since the days of the Core Wars. She was dizzy, vertiginous, a feeling she remembered from her first trips to the fringes of the Crust-forest, as a little girl with her father.

Her awareness seemed to implode. She became aware of her body - of the wide, dilated pores over her skin, the tension in her muscles, the knife still tucked into the frayed rope tight around her waist. She looked into Hork's wide, staring eyes. She saw recklessness there, exhilaration, intoxication, the fringes of insanity. Hork, overwhelmed by the journey, the realm of Ur-humans, Colonists and stars, had forgotten who he was. She hadn't. *She knew who she was:* Dura, Human Being, daughter of Logue - no more, and no less. And she was no more, no less qualified to speak for the peoples of the Star, at this moment, than anyone else. And that was why it was she who would have to act, now.

Her uncertainty congealed into determination. 'Hork, I don't care about the goals of these damn monster-men from the past. All I care about are my people - Farr, my family, the rest of the Human Beings. I won't sacrifice them for some ancient conflict; not while I have some hope of changing things.'

The wide, distorted mouth of Karen Macrae was opening again; as she spoke, Dura saw, distracted by the detail, that Karen's lips were not quite synchronized with her rustling words.

Time is long, inside our virtual world. But still, it is coming to an end. The Glitches have damaged us. Some have already lost coherence.

Stop the flight. We discover we do not want to die.

Dura closed her eyes and shuddered. The Colonists could no longer act. And so they had brought Star-humans - they had brought *her* - to this place, to save their world.

When she looked at Hork he was grinning, throwing his head back like some animal. ‘Very well, upfluxer. It seems I am outvoted, and not for the first time - although it doesn’t usually stop me. We are humans too, whatever our origins, and we must act, rather than die meekly as pawns in somebody else’s war!’ He shouted, ‘Do it!’

She cried out; she felt remote, numb. She hauled on the levers as hard as she could.

Crimson fire erupted from the base of the map-Star.

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27

Blue Xeelee light illuminated the Air. Fragments of shattered vortex lines hailed around Adda. He Waved furiously, squirming in the Air to avoid the deadly sleet, disregarding the pain in his back and legs. But even Waving wasn't reliable; the strength and direction of the Magfield was changing almost whimsically, and he had to be constantly aware of its newest orientation, of which way his Waving would take him among the lethal vortex fragments.

He came to a clearer patch of Air. He twisted, his hips and lower back protesting, and Waved to a halt. He looked back towards the City, now about a thousand mansheights away. The great wooden carcass was tilting noticeably, leaning across a Magfield which no longer cradled it. Its Skin was still a hive of activity, of kicked-out panels and scrambled evacuations; Adda was reminded of corruption, of swarms of insects picking over a dying face.

There was no sign of Farr.

Adda looked back to the upper Downside, to the location of the Hospital. He could see motion inside that widened gash in the Skin, but he couldn't make out Farr himself. *Damn, damn* . . . He shouldn't have let go of the boy; he should have dragged him physically away from the City, from the damn Hospital, until either his strength ran out or the City fell apart anyway.

I'm an old man, damn it. He'd had enough; he'd seen enough. Now all he wanted was rest.

Well, it looked as if he still had work to do. Shaking his head, he dipped his body in the Air and Waved back towards the groaning City.

In the Hospital of the Common Good, patients continued to be brought to the exit. Another dull explosion sounded somewhere in the guts of the City, but - to Adda's disbelief - the labouring volunteers scarcely looked up. He wanted to scream at them, to slap faces, to force these brave, foolish people to accept the reality of what was happening around them.

There were no cars returning to the port now. But nevertheless a volunteer hauled a helpless bundle - age and sex unidentifiable - to the breached Skin. The volunteer climbed out after the patient, gripped the bandaging with both hands, and, Waving backwards, began to drag the

patient away from the collapsing City. The volunteer was a young man, nude, his skin painted with elaborate, curling designs. This was evidently one of the aerobats who should have been taking part in the great Games spectacle today; instead here he was, his body-paint smeared and stained with pus, dragging a half-dead patient out from a dying City. Adda stared at the boy's face, trying to make out how the aerobat must feel at this implosion of his life, his hopes; but he read only fatigue, a dull incomprehension, determination.

'Adda!'

It was Farr's voice. Adda peered into the gloom of the ward, blinking to clear his one working eyecup.

'Adda - you must help me . . .'

There. Farr was close to the rear of the ward; he was hovering over another patient, a massive, still form wrapped in a cocoon. The boy seemed unharmed still, Adda saw with relief.

He pushed his way over the heads of the crowd.

The patient was lost in the cocoon with only a little flesh showing: a huge, crumpled fist, an area of shoulder or chest about the size of Adda's palm. The exposed flesh was surface-less, chewed up.

Adda suppressed a shudder and looked at Farr. The boy's face was drawn, the fatigue showing in his eyecups, the dilated Air-pores like craters on his cheeks.

'I'm glad you returned.'

'You're a damn fool, boy. I want you to know that now, in case I don't get a chance to tell you later.'

'But I had to return. I heard Bzya's voice. I . . .'

Something moved deep inside the cocoon - a head turning, perhaps? - and a claw-like finger protruded from the lip of the material, to pull the neck of the cocoon tighter closed. The tiny motion was redolent of shame.

'This is *Bzya*?'

'They had to pull him up from the underMantle. He was nearly lost - Adda, he had to abandon his Bell. He dragged back Hosch, but he was dead.' The boy looked down at his friend, his hands twisting together. 'We've got to get him out of here - away from the City.'

'But . . .'

There was another dull impact, deep in the guts of the City. The very Air seemed to shake with it, and the ceiling of the ward settled, wood splintering with a series of snaps. Then a mansheight-square section of the ceiling imploded, raining sharp wood splinters. This time the workers and patients had to take notice; screams were added to the bedlam of orders and frantic activity, and patients threw bare or bandaged arms over their faces.

‘All right,’ Adda said. ‘You take the head; I’ll push at the feet. Move, damn you . . .’

They scrambled for the entrance to the ward, hauling the cocoon beneath the splintered ceiling. They had to work through the melee, pushing with their feet at slow-moving limbs and heads.

Deni was nowhere to be seen.

It seemed to take a lifetime to reach the open mouth of the ward. They bundled Bzya out into the Air, over the port’s splintered lip; Bzya rolled in the Air, helpless in his cocoon. Adda and Farr scrambled after him. Farr made to grab the head end of Bzya’s cocoon once more, but Adda stopped him. He hauled Bzya around lengthways, so that the Fisherman was almost lying across their laps. ‘We’ll take him like this,’ Adda said. ‘Get hold. We’ll both Wave backwards . . .’

Farr nodded, understanding quickly. He took handfuls of the cocoon, and soon he and Adda were kicking backwards in parallel through the Air, hauling the massive cocoon after them.

The City, looming huge over them, settled once more, this time with screeches from deep within its fabric. Adda imagined the huge Corestuff girders, the bones of the great carcass, twisting, failing one by one. Explosions of shattering wood erupted all over the Skin. Huge, rectilinear creases emerged over the wooden face, as if the Skin were starting to fold over on itself.

Adda kicked desperately at the thick Air, ignoring the numb ache of his legs, the pain of fingers which were turning into claws as they dragged at cocoon material. Vortex fragments continued to hail through the Air, rings and other fantastic forms sleeting past them.

Suddenly Bzya’s body twisted in the Air. The Fisherman’s heavy legs thumped into Adda’s chest, causing him to lose his grip. Adda heard the Fisherman groan from within his cocoon at this latest disruption.

Adda slithered to a halt and scrabbled at the slick, expensive material of the cocoon, trying to regain purchase.

Farr had stopped Waving. He'd simply come to a halt in the Air and had dropped the cocoon, and was staring back at the City.

'By the blood of the Xeelee, boy . . .'

'Look.' Farr pointed back at the Hospital entrance. 'I think it's Deni.'

Adda rubbed dirt from his good eye and stared at the figures in the port. They were dwarfed by the huge wooden panorama of Skin all around them. Yes, it was Deni Maxx; the little doctor, all energy and competence, was working in the entrance to bring out still another patient.

There was a new sound from within the bulk of the City - a yielding sigh which slid rapidly to a higher pitch, almost as if in relief. Skin crumbled away in huge rafts of wood, revealing the Corestuff girder framework beneath. It looked like bones emerging through corrupt flesh. And, even as Adda watched, the girders, dully shining, were creasing, folding over.

Adda grabbed at the cocoon and kicked at the Air. His hands slid over the material and the inert bulk of Bzya barely stirred in the Air; but Adda clung to the material and tried again. In a moment Farr joined him, and soon the two of them were lunging backwards away from the City, their Waving ragged, spurting.

The face of the City - huge rents gaping - collapsed under its mask of anchor-bands and folded forward over them. The Corestuff structure showed no more resistance than if it had been constructed of soft pig-leather. Splinters of wood rained forward, bursting from the crumpling Skin.

Farr screamed: 'Deni!'

Through the chaos of the crumpling face of the Hospital port, Adda could see the compact form of the doctor, still working. She looked up, briefly, at the collapsing Skin above her. Then she turned back to her patients.

The port of the Hospital ward closed like a mouth.

In the very last heartbeat Adda saw Deni raise her arm against the huge jaw of wood and Corestuff which closed over her, as if - at last - trying to save herself. Ragged edges of wood met like meshing teeth, bursting her

body. A cloud of wood fragments and dust billowed from the crushed face of the City, obscuring the Hospital from Adda's view.

Farr was screaming incoherently, but he was still Waving, dragging at Bzya's cocoon.

'Scream!' Adda yelled over the crashing roar of the City. 'Scream and cry all you want, damn you! But *don't - stop - Waving*!'V

Hork pressed his face close to the surreally silent display. 'It's a jetfart,' he said wonderingly. He laughed. 'I can scarcely believe it. A jetfart, from the North Pole of a Star!'

Dura gripped the control levers, forcing her hands to remain clenched. The levers were warm, comfortable; they seemed to fit well in her palms. She felt as if she were trapped inside her head, an impotent observer of her own actions. She tried to imagine what must be happening inside the Mantle, if that map-globe really did represent the Star itself.

Hork Waved to the transparent wall, and stared at the tiny image of the battle. Eventually he turned to Dura and shouted, 'I think that's enough . . . You can let go.'

Dura stared at her hands. Her fingers wouldn't open; she had to glare at her rebellious hands, consciously willing them to uncurl.

Released, the levers slid gently back to their rest positions.

The fount from the map-Star dwindled, thinning to a fine plume before dying completely; the map itself folded up and disappeared.

'Is it over? We're not aimed at the Ring any more?'

Hork Waved back across the huge chamber. He turned the chair's arrow device this way and that, alternately studying the starbow and the field of stars, trying to judge the changes Dura had made.

Dura settled back in the chair, watching starfields explode silently across the sky.

'We haven't turned the Star around, if that's what you mean,' Hork said. 'But we've turned it aside. I think so, anyway . . . The Ring has moved away from the centre of that wall.' He pointed. 'We're still heading for the battlefield but we've deflected the Star; we're going to miss the Ring.'

She frowned, her feeling of distance, of unimportance, lingering. 'Will that be enough, do you think?'

'To stop the Xeelee destroying us?' He shrugged. 'I don't know, Dura. But we've done all we can.'

Dura looked at Hork, seeing a match in his broad face for her own sense of bewilderment, of anticlimax.

Hork held out his hand. ‘Come. We need to rest, I think, after such epic deeds. Let’s return to our wooden ship. We’ll eat, and try to relax.’

She allowed him to pull her out of the chair. Hand in hand, they Waved back to the inner tetrahedron.

As they entered it, Dura made her way towards the open hatchway of the ‘Pig’; but Hork held her arm. ‘Dura. Wait; look at this.’

She turned. He was pointing to the map on the inner wall of the tetrahedron - the map-Star, the wormhole diagram they had studied earlier. One of the wormhole routes - a path which snaked from the Core of the Star to its Crust, at the North Pole - was flashing, slowly and deliberately.

Hork nodded slowly. ‘I think I understand. This is how the Star-fount was made.’ He traced the wormhole with a fingertip. ‘See? When you hauled on your levers, Dura, this wormhole must have opened up. It took matter from the heart of the Star and transported it to the Crust. The Core material must have exploded at once in the lower pressure, releasing immense energy.

Dura felt odd; she seemed to see Hork as if at the far end of a long, dark corridor.

‘At the North Pole there must be huge engines to exploit this energy - the *discontinuity drive engines* Karen Macrae spoke of, which propel the Star itself.’ His gaze was distant. ‘Dura, some day we must reach those engines. And I wonder how the Colonists fared, when that wormhole belched . . .’

In Dura’s eyes all the colour had leeched from Hork’s face; even the lurid map on the tetrahedron wall had turned to shades of brown, and there was a strange, thin taste on her tongue.

She was exhausted, she realized. There would be time enough in the future for plans and dreams. For now, she longed for the comparative familiarity and security of the ‘Pig’, for food and sleep.

The rich, sweet stink of Air-pigs greeted her as she reached the ship’s entrance.

He touched Farr’s arm. ‘Wait. We stop here. That’s enough.’

Farr looked confused. He Waved through a couple more strokes, as if automatically; then, uncertainly, his legs came to rest. He released his grip

on the cocoon material and looked down at his hands, which were bent into stiff claws.

Adda let himself drift away from the cocoon and hang in the Air, giving way to his fatigue for the first time since the start of the disaster. The Magfield supported him, but he could feel its continuing shudders. The aches in his legs, arms, back and hands had gone beyond mere fatigue, beyond exhaustion now, he realized, and had transmuted into real pain. He inflated his chest, hauling in dank Polar Air, and felt the thick stuff burn at his lungs and capillaries. He remembered the dire warnings of poor, lost Deni Maxx: that after his encounter with the Air-sow his body would never regain its pneumatic efficiency. Well, this day he'd tested that diagnosis to its limits.

The City was a battered wooden box almost small enough to be covered over by the palm of a hand, with the long, elegant Spine spearing down from its base to the underMantle. A cloud diffused around the upper City, a mist of rubble and dispersing refugees.

The Xeelee starbreakers continued to walk through the Mantle. Vortex strings hailed all around them, deadly and banal.

He felt his eyes close; weariness and pain lapped over his mind, shutting out the world. This was the worst part of growing old: the slow, endless failure of his body that was slowly isolating him from the world, from other people, immersing him instead in a tiny, claustrophobic universe of his own weakness. Even now, even with the Mantle in its greatest crisis . . ..

Well, a small, sour part of him thought, *at least I won't grow any older, to find out how much worse it gets.*

' . . . Adda.' There was more wonder than fear in Farr's voice. 'Look at the City.'

Adda looked at the boy, then turned his aching neck to the distant tableau of Parz.

The City had already drifted far from its usual site directly over the Magfield Pole, tilting and twisting slowly as it travelled. Now that drift was accelerating. Parz, with all its precious freight of life, swung through the Air like a huge spin-spider. It was oddly graceful, Adda thought, like a huge dance. Then there was a cracking noise, a sharp sound which travelled even to this distance, uneasily like breaking bone. Wood fragments burst around

the junction of the City and its Spine - splinters which must be the size of Air-cars to be visible at this distance.

The Spine had snapped off.

The Spine remained suspended in the depths of the Polar Magfield, like an immense, battered tree trunk. The Spine must have been supplying much of the City's residual anchoring in the Magfield, for now the box-like upper section of Parz, with green wood-lamp light still gleaming from its ports, rolled forwards like an immense, grotesque parody of a lolling head.

The structure could not long stand such stress.

The Corestuff anchor-bands, dull and useless, folded, snapped and fell away in huge pieces. The clearwood bubble which enclosed the Stadium burst outwards, popping. The Palace buildings on the upper surface, like elaborately coloured toys with their miniature forests and displays, slid almost gracefully away into the Air, exposing the bare wooden surface beneath.

And now the City itself opened, coming apart like rotten wood.

The carcass split longitudinally, almost neatly, around the central structural flaw of Pall Mall. From the cracked-open streets and shops and homes, Air-cars and people spilled into the Air. The Market opened up like a spin-spider's egg, and the huge execution Wheel tumbled out into the Air.

The sounds of cracking wood, of twisting Corestuff, carried through the Air, mercifully drowning the cries of the humans.

Adda tried to imagine the terror of those stranded citizens; perhaps some of them had never ventured beyond the Skin before, and now here they were cast into the Air, helpless amid clouds of worthless possessions.

Now the residual structure of Parz imploded into fragments. All traces of the City's shape were lost. The cloud of rubble, of wood, Corestuff and struggling people, drifted through the Air away from the amputated Spine, slowly diffusing.

Adda closed his eyes. There had been a grandeur about that huge death. Almost a grace, a defiance of the Xeelee's actions which had been, in its way, magnificent.

'Adda.' Farr was pulling at his arm and pointing.

Adda followed the boy's finger. At first he could see nothing - only the lurid crimson glow around the Northern horizon, the yellow chaos of the Air . . .

Then he realized that the boy was pointing out an *absence.*

The starbreaker beams were gone.

Adda felt something lift from his heart. Perhaps some of them might yet live through this.

But then more vortex fragments came gusting towards them, precluding thought; gripping the boy's hand as hard as he could, Adda stared into the mouth of the storm and grabbed at Bzya's cocoon.

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28

The Interface was glowing.

The shouting woke Borz from a deep, untroubled sleep. He stretched and scowled around, looking for the source of the trouble. He reached to his belt and pulled out his Air-hat, jammed it on his head. He didn't really need the hat, of course, but he thought it gave him a bit more authority with the scavenging, thieving upfluxers who came by all the time and . . .

The Interface was glowing. The edges around its four triangular faces were shining, vortex-line-blue, so bright he was forced to squint. And the faces themselves seemed to have been covered over by a skin of light, fine and golden, which returned reflections of the yellow Mantle-light, the vortex lines, his own bulky body.

A deep, superstitious awe stirred in Borz.

There was no sign of the pigs, which had been stored at the heart of the tetrahedron. And the various possessions - clothes, tools, weapons - which had been attached to the tetrahedron's struts by bits of rope and net now tumbled around in the Air. A length of rope drifted past him. He grabbed it and laid it in his huge palm; the rope looked scorched.

People, adults and children alike, were Waving away from the Interface, crying and wailing in their panic. Borz - and two or three of the other men and women - held their place.

The Interface hadn't worked for generations - not since the Core Wars; everyone knew that. But it was obviously working now. Why? And - Borz ran a tongue over his hot, Airless lips, and he felt the pores on his face dilate - and what might be coming through it?

The face-light died, slowly. The faces turned transparent once more. The glow of the tetrahedral frame faded to a drab blackness.

The Interface was dead again; once more it was just a framework in the Air. Borz felt an odd, unaccustomed stab of regret; he knew he'd never again see those colours, that light.

The pigs had gone from the heart of the framework. But they'd been replaced by something else - an artifact, a clumsy cylinder of wood three mansheights tall. There were clear panels set in the walls of the cylinder, and bands of some material, dully reflective, surrounded its broad carcass.

A hatch in the top of the cylinder was pushed open. A man - *just* a *man* - pushed his face out; the face was covered by an extravagant beard.

The man grinned at Borz. ‘What a relief, he said. ‘We needed some fresh Air in here.’ He looked down into the cylinder. ‘You see, Dura, I knew Karen Macrae would get us home.’

‘Hey.’ Borz Waved with his thick legs until his face was on a level with the strange man’s. ‘Hey, you. Where are our pigs?’

‘Pigs?’ The man seemed puzzled, then he looked around at the dead Interface. ‘Oh. I see. You kept your pigs inside this gateway, did you?’

‘Where are they?’

The man looked amused, but sympathetic. ‘A long way from here, I fear.’ He sniffed the Air and stared around, his gaze frank, confident and inquisitive. ‘Tell me, which way’s South?’

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29

Toba Mixxax, his round face pale in the heat, stuck his head out of his Air-car. ‘Sounds like Mur and Lea are arguing again.’

Toba’s car had approached unnoticed. Dura had been labouring to fix ropes to a section of collapsed Skin. She backed away from her work, her arms and hands aching. Even here, on the outer surface of the dispersing cloud of debris that marked the site of the ruined City, the heat and noise were all but unbearable, and the work was long, hard and dangerous. As she listened now, she could hear the raised voices of Lea and Mur. She felt a prickle of irritation - how long was she going to have to hand-hold these people, before they learned to work together like adults?

But as she studied Toba’s familiar round face - with its uncertain expression, its pores dilated in the heat - the irritation vanished as soon as it had come. She straightened up and smiled. ‘Nice to see you, farmer.’

Toba’s answering smile was thin. ‘You look tired, Dura . . . We’re all exhausted, I suppose. Anyway,’ with a touch of strain entering his voice, ‘I’m not a farmer any more.’

‘But you will be again,’ Dura said, Waving towards him. ‘I’m sorry, Toba.’

Stretching the stiffness out of her back, she looked around the sky. The vortex lines had reformed and now crossed the sky in their familiar hexagonal arrays, enclosing, orderly and reassuring; the Magfield, restored to stability, was a firm network of flux in the Air - a base for Waving, for building again.

She studied the lines, examining their spacing through her fingers. Their slow pulsing told her that it would soon be time for Hork’s Wheel ceremony, at the heart of the ruined City.

‘How’s the farm?’ she asked carefully. ‘Is Ito . . .’

‘We’re putting it back together again,’ Toba said. ‘Slowly. Ito is . . . bearing up. She’s very quiet.’ For a moment his small, almost comical mouth worked as if he were struggling to express his feelings. ‘You know Farr’s there with her. And some of Cris’s friends, the Surfers. Cris has gone. But I think Ito finds the young people around her a comfort.’

Dura touched his arm. ‘It’s all right. You don’t have to say anything. Come on; maybe you can help me sort out Lea and Mur . . .’

Toba climbed out of his car.

Together, they made their way through the City site. Parz had become a cloud of floating fragments of Skin, twisted lengths of Corestuff girder, all suffused by the endless minutiae of the human world, spilled carelessly into the Air. She could see, at the cloud's rough centre, the execution Wheel, cast adrift from the old Market. Even from this vantage point - close to the cloud's outer edge - Dura could see clothes, toys, scrolls, cocoons, cooking implements: the contents of a thousand vanished homes. Those few sections of the City which had survived the final Glitch continued to collapse spasmodically - even now, weeks after the withdrawal of the Xeelee - and to the careless eye the swarms of humans crawling over the floating remains must look, she thought, like leeches, scavengers hastening the destruction of some immense, decomposing corpse, adrift in the turgid Air of the Pole. Many of the City's former inhabitants, recently refugees, had returned to Parz to seek belongings and to help with the reconstruction. There had been some looting, true - and too many people had come back here, intent on picking over the remains of a City which would not be restored to anything like its former completeness for many years.

But Hork's emergency edicts against a mass return to the City seemed to be holding. Enough of the City's former inhabitants had dispersed to the recovering ceiling-farms of the hinterland - and stayed there to work - to reduce fears of famine. And genuine reconstruction and recovery were progressing now. Already teams of workers had succeeded in locating the surviving dynamos. The great engines - which had once powered anchor-band currents - had been cleared of rubble and stumps of infrastructure. Now the dynamos floated in clear spaces, their lumpy Corestuff hides gleaming dully in the purple light of the Quantum Sea as if they were immense, protected animals.

It could still go wrong, Dura thought uneasily. The fragile society left adrift by the Xeelee Glitch could still fall apart - disintegrate into suicidal conflict over dwindling resources, over once-precious goods from the old Parz which had been reduced in value to trinkets by the disaster.

But not just yet. Now, people seemed - on the whole - to be prepared to work together, to rebuild. This was a time of hope, of regeneration.

Dura welcomed her own aching muscles and stiff back. It was evidence of the hard work that comprised her own small part of the Mantle-wide

rebuilding effort She felt a surge of optimism, of energy; she suspected that the days to come would be some of the happiest of her life.

In a clear space a few mansheights from the car, the Human Being Mur had been showing Lea - a pretty girl who had once been a Surfer - how to construct nets from the plaited bark of Crust-trees. The two of them were surrounded by a cloud of half-coiled ropes and abandoned sections of net. Little Jai - reunited with his father - wriggled through the Air around them, nude and slick, grasping at bits of rope and gurgling with laughter. Lea was brandishing a length of rope in Mur's face. 'Yes, but I don't see why I have to do it over.'

Mur's voice was cracking with anger, making him sound very young. Compared to the City girl, Mur still looked painfully thin, Dura thought. 'Because it's wrong,' he said. 'You've done it wrong. Again! And I—'

'And I don't see why I should put up with that kind of talk from the likes of you, upfluxer.'

Toba placed his hands on the girl's shoulders. 'Lea, Lea. You shouldn't speak to our friends like that.'

'Friends?' The girl launched into an impressive round of cursing. Toba looked pale and pulled away from her, dismayed.

Dura took the rope which Lea was rejecting. 'Perhaps Mur didn't explain,' she said smoothly. 'You have to double plait the rope to give it extra strength.' She hauled at sections of it, demonstrating its toughness.

'But the way he speaks to me—'

'This plaiting is finely done.' She looked at Lea. 'Did you do this?'

'Yes, but—'

Dura smiled. 'It takes most Human Beings years of practice to learn such a skill, and you've almost mastered it already.'

Lea, distracted by the praise, was visibly struggling to stay angry; she pushed elaborately dyed hair from her forehead.

Dura passed the rope to her. 'With a bit more help from Mur, I'll be coming to you for instruction. Come on Toba, let's take a break; I'd like to see how Adda is getting on.'

As they moved away Dura was careful not to make a show of looking round, but she could see that Mur and Lea were moving back towards each other, warily, and picking up sections of rope once more.

She felt rather smug at her success at defusing the little situation. And she was secretly pleased at this evidence that the Human Beings were managing to adjust to the situation they'd found here at the Pole - better than some of Parz's former inhabitants, it seemed. Dura had expected the Human Beings to be shocked, disappointed to arrive at the Pole after their epic journey across the sky, only to find nothing more than a dispersing cloud of rubble. In fact they'd reacted with much more equanimity than she'd anticipated . . . especially once reunited with their children. The Human Beings simply hadn't known what to expect here. They couldn't have imagined Parz in all its glory - any more than she herself could have, before Toba brought her here for the first time. For the little band of Human Beings, the immense number of people, the huge, mysterious engines, the precious artifacts scattered almost carelessly through the Air, had been wonder enough.

One section of the rough, expanding City-cloud had been cordoned off, informally, to serve as a Hospital area. Dura and Toba pushed through the cloud of debris until they were moving through arrays of patients, drifting comfortably in the Air and loosely knotted together with lengths of rope. Dura cast a cursory, slightly embarrassed glance at the patients. Many people had been left so damaged by the Glitch that they would never function fully again; but the care they were receiving was clearly competent. The bandaging and splints seemed undamaged and clean. One of the blessings of the destruction of Parz was that its scale had been so immense many smaller, more robust items in the City - like medical equipment - had simply been spilled into the Air, undamaged.

As they neared the heart of the improvised Hospital, Muub, once Court Physician, emerged to meet them. Muub had abandoned his impractical finery, replacing it with what looked like a Fisherman's many-pocketed smock. His smile was broad and welcoming beneath his shining bare scalp, and the Physician looked as happy as Dura could remember seeing him - liberated, even.

Muub led them to Adda. The old upfluxer was standing a sullen guard over an outsized, sealed cocoon. Dura knew that the cocoon contained Bzya, the crippled Fisherman, who still could do little more than bellow half-coherent phrases from his ruin of a mouth. Bzya was evidently asleep. But Adda seemed content to spend much of his waking time with his friend,

keeping watch over him and serving as a clumsy nurse when necessary, helping Jool and their daughter - Shar, who had returned from the ceiling-farms - to tend to him.

Adda embraced Dura, and asked after the rest of the Human Beings. Dura told him about Mur and Lea, and Muub added, ‘There are points of friction. But your upfluxers are working well with the citizens of Parz. Don’t you agree, Adda?’

The old man growled, his face as sour as ever. ‘Maybe. Maybe not. Maybe we’re “fitting in” too damn well.’

Dura smiled. ‘You’re too much of a cynic, dear Adda. Nobody forced the Human Beings to come here, to help the City folk dig their way out of the rubble.’

‘Although were delighted you’re here,’ Muub said expansively. Without your upflux-hardened muscles we wouldn’t be making half the progress we’ve managed so far.’

‘Sure. As long as were not using our “upflux-hardened muscles” to build another nice, neat cage for ourselves.’

Dura said, ‘Now, Adda—

Toba Mixxax said nervously, ‘But you were never in a cage. I don’t understand.’

Muub held up his hands. ‘Adda has a point. And while we’re rebuilding our City, it’s a time to think about rebuilding our hearts as well. The Human Beings were in a cage, Toba. As were we all: a cage of ignorance, prejudice and suppression.’

Dura looked at him carefully. ‘You genuinely accept that?’

‘Do we need a City at all?’ Adda asked sourly. ‘Maybe it’s time for a fresh start without one.’

Dura shook her head. ‘I don’t think I agree with that. Not any more. The benefits of a City - stability, a repository of understanding, the access to medicine - all of these will help us all, everyone in the Mantle.’ She fixed Muub with a sharp glance. ‘Won’t they?’

He nodded seriously. ‘We could never advance from a base of subsistence farming. But the City must never again become a fortress-prison. That’s why we’re planning a whole series of satellite communities, with the City as the hub. We should not trap most of humanity in one place, so vulnerable to disasters from without - and from our own hearts.’

Adda snorted. ‘You talk about human nature. What’s to stop human nature from reasserting itself where prisons and fortresses are concerned?’

‘Only the strong and continuing efforts of good men and women,’ Muub said evenly. ‘Hork shares these goals. He’s talking about new kinds of power structures - representative councils which would give all of the Mantle’s people a say in the way things are run.’

‘Knowing Hork,’ Dura admitted, ‘I find that a little hard to swallow.’

‘Then try harder,’ Muub said sternly. ‘Hork is no sentimental dreamer, Dura. He faces realities and acts on them. He knows that without the ancient wisdom of the Human Beings - without the clues you people brought about the Core Wars, the possibility of retrieving some of the ancient technology - the City would have been wiped out by the Xeelee attack, without even knowing why. Perhaps the race itself would have perished . . . We need each other. Hork accepts that, and is going to make sure we don’t lose what we’ve gained. Surely his litany, today, is evidence of his goodwill. Perhaps we could construct a new integrated philosophy, incorporating the best elements of all these strands - the Xeelee philosophy, the Wheel followers - and build a new faith to guide us . . .’

Dura laughed. ‘Maybe. But we’ll have to put the City back together first.’

Adda rubbed his nose. ‘Perhaps. But I don’t think we’ll have Farr here to help us.’

‘No,’ Dura said. ‘He’s determined to return to the Quantum Sea, in a new improved “Flying Pig”. To find the Colonists again. But he’s accepted he needs to put in some time rebuilding his own world first, before flying off to win new ones . . .’

‘Not a poor ambition to have,’ Muub said, smiling thinly. ‘Quite a number of us are intrigued by what you learned of the Colonists . . . and the huge Ur-human engines at the North Pole. Of course, we don’t know any way of travelling more than a few tens of metres from the South Pole, let alone of crossing the Equator . . . but we’ll find a way.’ ‘Why should there be a way at all?’ Adda asked cynically. ‘This Star is a hostile environment, remember. The Glitches have forced that into our heads, if nothing else. We’ve no guarantee we’ll ever be able to achieve much more than we can do now. After all the Ur humans left us to die with the Star; they didn’t believe in any future for us.’ ‘Perhaps!’ Muub smiled. ‘But perhaps not.

Here’s a speculation for you. What if the Ur-humans didn’t intend us to be destroyed when the Star impacted the Ring? What if the Ur-humans left us some means of escaping from the Star?’

Dura said ‘Like the wormhole to the planet—’

‘Or,’ Muub said, ‘even a ship - an Air-car that could travel outside the Star itself.’ He looked up at the Crust, a look of vague dissatisfaction on his face. ‘What lies beyond that constraining roof over our world? The glimpses you saw, Dura, of other stars - hundreds, millions of them - each one, perhaps, harbouring life - not human as we are and yet human, descended from the Ur-stock . . . And then, behind it all the Ur-humans themselves, still pursuing their own aloof goals. To see it all - what a prize that would be! Yes, Adda; many of us are very curious indeed about what might lie at the far Pole . . .

‘Yet even that will tell us so little of the true history of our universe. What is the true purpose of Bolder’s Ring? What are the Xeelee’s intentions - who, where is the enemy they seem to fear so much?’ He smiled, looking wistful. ‘I will resent dying without the answers to such questions, as I surely will . . .’

In the distance, in the opened heart of the City hundreds of mansheights away, pipes began to bray: Hork calling his citizens to him. Muub bid a hasty farewell to his friends.

With Adda, Dura began to make her way towards the heart of the debris cloud. As they Waved, peacefully, she slipped her hand into his.

‘We’ve come a long way, daughter of Logue, Adda said.

Dura looked at him with a little suspicion, but there was no sign of irony in his expression; his good eye returned her gaze with a softness she hadn’t often seen there before.

She nodded. ‘We have . . .’ And some of us a little further than others, she thought. ‘How’s Bzya?’

He sniffed. ‘Surviving. Accepting what he has. Which is a lot, I suppose; he has Jool and Shar both with him now . . .’

‘And you,’ she said.

He didn’t reply.

‘Do you think you’ll stay with them?’

He shrugged, with an echo of his old cantankerousness, but his expression remained soft.

She squeezed his hand. ‘I’m glad you’ve found a home,’ she said.

As they neared the Wheel at the heart of the debris cloud, they could hear once more the thin, clear voice of Physician Muub as he addressed the crowd gathering there.

‘ . . . The cult of the Xeelee, with its emphasis on higher goals than those of the here-and-now, was impossible for Parz’s closed, controlled society to accommodate. It was only by the suppression of these elements - the expulsion of the Xeelee cultists, the Reformation’s expunging of any genuine information about the past - that the authorities thought the City could survive.

‘Well, they were wrong.

‘Human nature will flourish, despite the strictest controls. The upfluxers kept their ancient knowledge almost intact - across generations, and with little recourse to records or writing materials. New faiths - like the cult of the Wheel - bloomed in the desert left by the destruction of beliefs and knowledge.’ Muub hesitated, and - unable to see him - Dura remembered how his cup-retinae characteristically lost some of their focused shape, briefly, as he turned to his inner visions. ‘It’s interesting that both among the exiled Human Beings - and among the almost equally disadvantaged Downsiders, here in Parz - a detailed wisdom from the past survived, by oral tradition alone. If we are all descended from Stellar engineers - from a highly intelligent stock - perhaps we should not be surprised at such evidence of mentation, crossing generations. Indeed, the systematic waste of such talent seems a crime. How much more might man have achieved in this Star by now, if not for petty prejudice and superstition . . .’

Adda snorted. ‘Unctuous old fart.’

Dura laughed.

‘And I wish I could see Hork’s face, as he Waves around having to listen to that.’

‘Maybe you misjudge him, Adda.’

‘Maybe. But then,’ he said slowly - carefully, she thought - ‘I’ve never been as close to him as you have.’

Again she studied the old man sharply, wondering how much he knew - or what he could read, in her face. He was watching her waiting for some reaction, his battered face empty of expression.

But what was her reaction? What did she want, now?

So much had happened since that first Glitch - the Glitch that had taken her father from her. Several times she had thought her life was finished - she'd never really believed she'd return to the Mantle, from the moment she boarded the 'Flying Pig' in Parz's Harbour. Now, she realised, she was simply grateful to be alive; and that simple fact would never leave her, would inform her enjoyment of the rest of her time.

And yet . . .

And yet her experiences had changed her. Having seen so much - to have travelled further, done so much more than any human since the days of the Colonists themselves - would make it impossible for her to settle back into the cramped lifestyle of a City dweller - and still less of a Human Being.

Absently she folded her arms across her stomach, remembering her single moment of passion with Hork - when she had allowed her intense need for privacy to be overcome, when she thought her life was almost lost, deep in the underMantle. She had found a brief spark of human warmth there; and Hork was surely wiser than she had first realised. But still, she had seen into Hork's soul in the Ur-human chamber, and she had recoiled from what she had found - the anger, the desperation, the need to find something worth dying for.

Hork could not be a companion for her.

'I've changed, Adda,' she said. 'I . . .'

'No.' He was shaking his head sadly, reading her face. 'Not really. You were alone before all this - before we came here - and you're still alone, now. Aren't you?'

She sighed. A little harshly, she said, 'If that's how I'm meant to be then maybe I should accept it.' She turned; beyond Parz's cloud of rubble she could see the ceiling fields of the hinterland: bare, scrubbed clean of their cultivation - and yet, in a way, renewed. 'Maybe that's where I will go,' she said.

He turned to see. 'What and become a farmer? Making pap-wheat for the masses? You?'

She grinned. 'No. No, making a place of my own . . . a little island of order, in all of this emptiness.'

Adda snorted with contempt, but the pressure of his fingers around hers increased, gently, warmly.

The pipers’ calls were bright and harsh. From all around the cloud-City people were Waving into the Air, converging towards the Wheel at the heart of the cloud. Peering that way now, Dura could see the massive form of Hork - a colourful speck in his robes, his massive arms resting on the huge Wheel. She imagined she could already hear his voice as he recited the litany - the first legal Wheel-litany, a list of all those known to have died in the final Glitch, whether they were from Parz, the hinterland, the upflux, the Skin.

It was a litany intended to conciliate and heal.

The two Human Beings, Waving strongly, joined the shoal of people converging on the Wheel. Around them, the shimmering vortex lines marched steadily across the sky, renewed and strong.

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RING
PART I

EVENT: SYSTEM

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1

Even at the moment she was born she knew something was wrong.

A face loomed over her: wide, smooth, smiling. The cheeks were damp, the glistening eyes huge. ‘Lieserl. Oh, Lieserl . . .’

Lieserl. My name, then.

She explored the face before her, studying the lines around the eyes, the humorous upturn of the mouth, the strong nose. It was an intelligent, lived-in face. *This is a good human being*, she thought. *Good stock . . .*

‘Good stock’?

This was impossible. *She* was impossible. She felt terrified of her own explosive consciousness. She shouldn’t even be able to focus her eyes yet . . .

She tried to touch her mother’s face. Her own hand was still moist with amniotic fluid - *but it was growing visibly*, the bones extending and broadening, filling out the loose skin as if it were a glove.

She opened her mouth. It was dry, her gums already sore with budding teeth.

Strong arms reached beneath her; bony adult fingers dug into the aching flesh of her back. She could sense other adults surrounding her, the bed in which she’d been born, the outlines of a room.

Her mother held her high before a window. Lieserl’s head lolled, the expanding muscles still too weak to support the burgeoning weight of her skull. Spittle laced across her chin.

An immense light flooded her eyes.

She cried out.

Her mother enfolded her in her arms. ‘The Sun, Lieserl. *The Sun . . .*’

The first few days were the worst.

Her parents - impossibly tall, looming figures - took her through brightly lit rooms, a garden always flooded with sunlight. She learned to sit up. The muscles in her back fanned out, pulsing as they grew. To distract her from the unending pain, clowns tumbled over the grass before her, chortling through huge red lips, before popping out of existence in clouds of pixels.

She grew explosively, feeding all the time, a million impressions crowding into her soft sensorium.

There seemed to be no limit to the number of rooms in this place, this *House*. Slowly she began to understand that some of the rooms were Virtual chambers - blank screens against which any number of images could be projected. But even so, the House must comprise hundreds of rooms. And she - with her parents - wasn't alone here. There were other people. But at first they kept away, out of sight, apparent only by their actions: the meals they prepared, the toys they left her.

On the third day her parents took her on a trip by flitter. It was the first time she'd been away from the House, its grounds. As the flitter rose she stared through the bulbous windows, pressing her nose to heated glass.

The House was a jumble of white, cube-shaped buildings, linked by corridors and surrounded by garden - grass, trees. Further out there were bridges and roads looping through the air above the ground, more houses like a child's bricks sprinkled across glowing hillsides.

The flitter soared higher.

The journey was an arc over a toylike landscape. A breast of blue ocean curved away from the land, all around her. This was the island of Skiros, Phillida - her mother - told her, and the sea was called the Aegean. The House was the largest construct on the island. She could see huge, brown-painted spheres dotting the heart of the island: carbon-sequestration domes, Phillida said, balls of dry ice four hundred yards tall.

The flitter snuggled at last against a grassy sward close to the shore of the ocean. Lieserl's mother lifted her out and placed her - on her stretching, unsteady legs - on the rough, sandy grass.

Hand in hand, the little family walked down a short slope to the beach.

The Sun burned from an unbearably blue sky. Her vision seemed telescopic. She looked at distant groups of children and adults playing - far away, halfway to the horizon - and it was as if she was among them herself. Her feet, still uncertain, pressed into gritty, moist sand.

She found mussels clinging to a ruined pier. She prised them away with a toy spade, and gazed, fascinated, at their slime-dripping feet. She could taste the brine salt on the air; it seemed to permeate her very skin.

She sat on the sand with her parents, feeling her light costume stretch over her still-spreading limbs. They played a simple game, of counters moving over a floating Virtual board, with pictures of ladders and hissing

snakes. There was laughter, mock complaints by her father, elaborate pantomimes of cheating.

Her senses were electric. It was a wonderful day, full of light and joy, extraordinarily vivid sensations. Her parents loved her - she could see that in the way they moved with each other, came to her, played with her.

They must know she was different; but they didn't seem to care.

She didn't want to be different - to be *wrong*. She closed her mind against her fears, and concentrated on the snakes, the ladders, the sparkling counters.

Every morning she woke up in a bed that felt too small.

Lieserl liked the garden. She liked to watch the flowers straining their tiny, pretty faces towards the Sun, as the great light climbed patiently across the sky. The sunlight made the flowers grow, her father told her. Maybe she was like a flower, she thought, growing too quickly in all this sunlight.

The House was full of toys: colourful blocks, and puzzles, and dolls. She picked them up and turned them over in her stretching, growing hands. She rapidly became bored with each toy, but one little gadget held her attention. It was a tiny village immersed in a globe of water. There were tiny people in there, frozen in mid-step as they walked, or ran, through their world. When her awkward hands shook the globe, plastic snowflakes would swirl through the air, settling over the encased streets and rooftops. She stared at the entombed villagers, wishing she could become one of them: become frozen in time as they were, free of this pressure of *growing.*

On the fifth day she was taken to a wide, irregularly shaped, sunlight-drenched classroom. This room was full of children - *other children*! The children sat on the floor and played with paints and dolls, or talked earnestly to brilliantly coloured Virtual figures - smiling birds, tiny clowns.

The children turned to watch as she came in with her mother, their faces round and bright, like dapples of sunlight through leaves. She'd never been so close to other children before. Were these children *different* too?

One small girl scowled at her, and Lieserl quailed against her mother's legs. But Phillida's familiar warm hands pressed into her back. 'Go ahead. It's all right.'

As she stared at the unknown girl's scowling face, Lieserl's questions, her too-adult, too-sophisticated doubts, seemed to evaporate. Suddenly, all

that mattered to her - all that mattered in the world - was that she should be accepted by these children: that they wouldn't know she was *different*.

An adult approached her: a man, young, thin, his features bland with youth. He wore a jumpsuit coloured a ludicrous orange; in the sunlight, the glow of it shone up over his chin. He smiled at her. 'Lieserl, isn't it? My name's Paul. We're glad you're here. Aren't we, people?'

He was answered by a rehearsed, chorused 'Yes'.

'Now come and we'll find something for you to do,' Paul said. He led her across the child-littered floor to a space beside a small boy. The boy - red-haired, with startling blue eyes - was staring at a Virtual puppet which endlessly formed and reformed: the figure two, collapsing into two snowflakes, two swans, two dancing children; the figure three, followed by three bears, three fish swimming in the air, three cakes The boy mouthed the numbers, following the tinny voice of the Virtual. 'Two. One. Two and one is three.'

Paul introduced her to the boy - Tommy - and she sat down with him. Tommy, she was relieved to find, was so fascinated by his Virtual that he scarcely seemed aware that Lieserl was present - let alone *different.*

Tommy was resting on his stomach, his chin cupped in his palms. Lieserl, awkwardly, copied his posture.

The number Virtual ran through its cycle. 'Bye bye, Tommy! Goodbye, Lieserl!' It winked out of existence.

Now Tommy turned to her - without appraisal, merely looking, with unconscious acceptance.

Lieserl said, 'Can we see that again?'

He yawned and stuck a finger into one nostril. 'No. Let's see another. There's a great one about the pre-Cambrian explosion—'

'The what?'

He waved a hand dismissively. 'You know, the Burgess Shale and all that. Wait till you see *Hallucigenia* crawling over your neck . . .'

The children played, and learned, and napped. Later, the girl who'd scowled at Lieserl - Ginnie - started some trouble. She poked fun at the way Lieserl's bony wrists stuck out of her sleeves (Lieserl's growth rate was slowing, but she was still expanding out of her clothes each day). Then - unexpectedly, astonishingly - Ginnie started to bawl, claiming that Lieserl had walked through her Virtual. When Paul came over, Lieserl started to

explain, calmly and rationally, that Ginnie must be mistaken; but Paul told her not to cause such distress, and for punishment she was forced to sit away from the other children for ten minutes, without stimulation.

It was all desperately, savagely unfair. It was the longest ten minutes of Lieserl's life. She glowered at Ginnie, filled with resentment.

The next day she found herself looking forward to going to the room with the children again. She set off with her mother through sunlit corridors. They reached the room Lieserl remembered - there was Paul, smiling a little wistfully to her, and Tommy, and the girl Ginnie - but Ginnie seemed different: childlike, unformed . . .

At least a head shorter than Lieserl.

Lieserl tried to recapture that delicious enmity of the day before, but it vanished even as she conjured it. Ginnie was just a kid.

She felt as if something had been stolen from her.

Her mother squeezed her hand. 'Come on. Let's find a new room for you to play in.'

Every day was unique. Every day Lieserl spent in a new place, with new people.

The world glowed with sunlight. Shining points trailed endlessly across the sky: low-orbit habitats and comet nuclei, tethered for power and fuel. People walked through a sea of information, with access to the Virtual libraries available anywhere in the world, at a subvocalized command. The landscapes were drenched with sentience; it was practically impossible to get lost, or be hurt, or even to become bored.

On the ninth day Lieserl studied herself in a Virtual holomirror. She had the image turn around, so she could see the shape of her skull, the lie of her hair. There was still some childish softness in her face, she thought, but the woman inside her was emerging already, as if her childhood was a receding tide. She would look like Phillida in the strong-nosed set of her face, her large, vulnerable eyes; but she would have the sandy colouring of her father, George.

Lieserl looked about nine years old. But she was just nine *days* old.

She bade the Virtual break up; it shattered into a million tiny, fly-sized images of her face which drifted away in the sunlit air.

Phillida and George were fine parents, she thought. They were physicists; and they both belonged to an organization they called

‘Paradoxa’. They spent their time away from her working through technical papers - which scrolled through the air like falling leaves - and exploring elaborate, onion-ring Virtual models of stars. Although they were both clearly busy, they gave themselves to her without hesitation. She moved in a happy world of smiles, sympathy and support.

Her parents loved her unreservedly. But that wasn’t always enough.

She started to come up with complicated, detailed questions. Like, what was the mechanism by which she was growing so rapidly? She didn’t seem to *eat* more than the other children she encountered; what could be fuelling her absurd growth rate?

How did she *know* so much? She’d been born self-aware, with even the rudiments of language in her head. The Virtuals she interacted with in the classrooms were fun, and she always seemed to learn something new; but she absorbed no more than scraps of knowledge through the Virtuals compared to the feast of insight with which she awoke each morning.

What had taught her, in the womb? What was teaching her now?

The strange little family had worked up some simple, homely rituals together. Lieserl’s favourite was the game, each evening, of snakes and ladders. George brought home an old set - a *real* board made of card, and wooden counters. Already Lieserl was too old for the game; but she loved the company of her parents, her father’s elaborate jokes, the simple challenge of the game, the feel of the worn, antique counters.

Phillida showed her how to use Virtuals to produce her own game boards. Her first efforts, on her eleventh day, were plain, neat forms, little more than copies of the commercial boards she’d seen. But soon she began to experiment. She drew a huge board of a million squares. It covered a whole room - she could walk through the board, a planar sheet of light at about waist height. She crammed the board with intricate, curling snakes, vast ladders, vibrantly glowing squares - detail piled on detail.

The next morning she walked with eagerness to the room where she’d built her board - and was immediately disappointed. Her efforts seemed pale, static, derivative: obviously the work of a child, despite the assistance of the Virtual software.

She wiped the board clean, leaving a grid of pale squares floating in the air. Then she started to populate it again - but this time with animated half-human snakes, slithering ‘ladders’ of a hundred forms. She’d learned to

access the Virtual libraries, and she plundered the art and history of a hundred centuries to populate her board.

Of course it was no longer possible to play games on the board, but that didn't matter. The board was the thing, a world in itself. She withdrew a little from her parents, spending long hours in deep searches through the libraries. She gave up her daily classes. Her parents didn't seem to mind; they came to speak to her regularly, and showed an interest in her projects, but they respected her privacy.

The board kept her interest the next day. But now she evolved elaborate games, dividing the board into countries and empires with arbitrary bands of glowing light. Armies of ladder-folk joined with legions of snakes in crude recreations of the great events of human history.

She watched the symbols flicker across the Virtual board, shimmering, coalescing; she dictated lengthy chronicles of the histories of her imaginary countries.

By the end of the day, though, she was starting to grow more interested in the history texts she was consulting than in her own elaborations on them. She went to bed, eager for the next morning to come.

She awoke in darkness, doubled in agony.

She called for light. She sat up in bed.

Blood spotted the sheets. She screamed.

Phillida sat with her, cradling her head. Lieserl pressed herself against her mother's warmth, trying to still her trembling.

'I think it's time you asked me your questions.'

Lieserl sniffed. 'What questions?'

'The ones you've carried around with you since the moment you were born.' Phillida smiled. 'I could see it in your eyes, even at that moment. You poor thing . . . to be burdened with so much *awareness*. I'm sorry, Lieserl.'

Lieserl pulled away. Suddenly she felt cold, vulnerable. '*Who am I*, Phillida?'

'You're my daughter.' Phillida placed her hands on Lieserl's shoulders and pushed her face close; Lieserl could feel the warmth of her breath, and the soft room light caught the grey in her mother's blond hair, making it shine. 'Never forget that. You're as human as I am. But—' She hesitated.

'But what?'

‘But you’re being - *engineered.*

‘There are *nanobots* in your body,’ Phillida said. ‘Do you understand what a nanobot is? A machine at the molecular level which—’

‘I know what a nanobot is,’ Lieserl snapped. ‘I know all about AntiSenescence and nanobots. I’m not a child, Mother.’

‘Of course not,’ Phillida said seriously. ‘But in your case, my darling, the nanobots have been programmed - not to reverse ageing - but to *accelerate* it. Do you understand?’

Nanobots swarmed through Lieserl’s body. They plated calcium over her bones, stimulated the generation of new cells, forced her body to sprout like some absurd human sunflower - they even implanted memories, artificial learning, directly into her cortex.

Lieserl felt like scraping at her skin, gouging out this artificial infection. ‘*Why?* Why did you let this be done to me?’

Phillida pulled her close, but Lieserl stayed stiff, resisting mutely. Phillida buried her face in Lieserl’s hair; Lieserl felt the soft weight of her mother’s cheek on the crown of her head. ‘Not yet,’ Phillida said. ‘Not yet. A few more days, my love. That’s all . . .’

Phillida’s cheeks grew warmer, as if she were crying, silently, into her daughter’s hair.

Lieserl returned to her snakes and ladders board. She found herself looking on her creation with affection, but also nostalgic sadness; she felt distant from this elaborate, slightly obsessive concoction.

Already she’d outgrown it.

She walked into the middle of the sparkling board and bade a Sun, a foot wide, rise out from the centre of her body. Light swamped the board, shattering it.

She wasn’t the only adolescent who had constructed fantasy worlds like this. She read about the Brontës, in their lonely parsonage in the north of England, and their elaborate shared world of kings and princes and empires. And she read about the history of the humble game of snakes and ladders. The game had come from India, where it was a morality teaching aid called *Moksha-Patamu*. There were twelve vices and four virtues, and the objective was to get to Nirvana. It was easier to fail than to succeed . . . The British in the nineteenth century had adopted the game as an instructional guide for children called *Kismet;* Lieserl stared at images of claustrophobic

boards, forbidding snakes. Thirteen snakes and eight ladders showed children that if they were good and obedient their life would be rewarded.

But by a few decades later the game had lost its moral subtexts. Lieserl found images from the early twentieth century of a sad-looking little clown who clambered heroically up ladders and slithered haplessly down snakes.

The game, with its charm and simplicity, had survived through the twenty centuries which had worn away since the death of that forgotten clown. Lieserl stared at him, trying to understand the appeal of his baggy trousers, walking cane and little moustache.

She grew interested in the *numbers* embedded in the various versions of the game. The twelve-to-four ratio of *Moksha-Patamu* clearly made it a harder game to win than *Kismet*'s thirteen-to-eight - but how much harder?

She began to draw new boards in the air. But these boards were abstractions - clean, colourless, little more than sketches. She ran through high-speed simulated games, studying their outcomes. She experimented with ratios of snakes to ladders, with their placement. Phillida sat with her and introduced her to combinatorial mathematics, the theory of games - to different forms of wonder.

On her fifteenth day she tired of her own company and started to attend classes again. She found the perceptions of others a refreshing counterpoint to her own, high-speed learning.

The world seemed to open up around her like a flower; it was a world full of sunlight, of endless avenues of information, of stimulating people.

She read up on nanobots. She learned the secret of Anti-Senescence, the process which had rendered humans effectively immortal.

Body cells were programmed to commit suicide.

Left alone, a cell manufactured enzymes which cut its own DNA into neat pieces, and quietly closed itself down. The suicide of cells was a guard against uncontrolled growth - tumours - and a tool to sculpt the developing body: in the womb, for example, the withering of unwanted cells carved fingers and toes from blunt tissue buds.

Death was the default state of a cell. Chemical signals had to be sent out by the body, to instruct cells to remain alive. It was a dead-man's-switch control mechanism: if cells grew out of control - or if they separated from their parent organ and wandered through the body - the reassuring

environment of chemical signals would be lost, and they would be forced to die.

The nanotechnological manipulation of this process made AntiSenescmce simple.

It also made simple the manufacture of a Lieserl.

Lieserl studied this, scratching absently at her inhabited, engineered arms.

She looked up the word *Paradoxa* in the Virtual libraries. She had access to no plausible reference to it. She wasn't an expert at data mining, but she thought there was a hole here.

Information about Paradoxa was being kept from her.

With a boy called Matthew, from her class, she took a trip away from the House - without her parents, for the first time. They rode a flitter to the shore where she'd played as a child, twelve days earlier. She found the broken pier where she'd discovered mussels. The place seemed less vivid - less magical - and she felt a sad nostalgia for the loss of the freshness of her childish senses. She wondered why no adult ever commented on this dreadful loss of acuity. Perhaps they just forgot, she thought.

But there were other compensations.

Her body was strong, lithe, and the sunlight was like warm oil on her skin. She ran and swam, relishing the sparkle of the ozone-laden air in her lungs. She and Matthew mock-wrestled and chased in the surf, clambering over each other - like children, she thought, but not quite with complete innocence.

As sunset approached they allowed the flitter to return them to the House. They agreed to meet the next day, perhaps take another trip somewhere. Matthew kissed her lightly, on the lips, as they parted.

That night she could barely sleep. She lay in the dark of her room, the scent of salt still strong in her nostrils, the image of Matthew alive in her mind. Her body seemed to pulse with hot blood, with its endless, continuing growth.

The next day - her sixteenth - Lieserl rose quickly. She'd never felt so alive; her skin still glowed from the salt and sunlight of the shore, and there was a hot tension inside her, an ache deep in her belly, a tightness.

When she reached the flitter bay at the front of the House, Matthew was waiting for her. His back was turned, the low sunlight causing the fine hairs

at the base of his neck to glow.

He turned to face her.

He reached out to her, uncertainly, then allowed his hands to drop to his sides. He didn't seem to know what to say; his posture changed, subtly, his shoulders slumping slightly; before her eyes he was becoming shy of her.

She was taller than him. Visibly *older*. She became abruptly aware of the still-childlike roundness of his face, the awkwardness of his manner. The thought of *touching* him - the memory of her feverish dreams during the night - seemed absurd, impossibly adolescent.

She felt the muscles in her neck tighten; she felt as if she must scream. Matthew seemed to recede from her, as if she were viewing him through a tunnel.

Once again the labouring nanobots - the vicious, unceasing technological infection of her body - had taken away part of her life.

This time, though, it was too much to bear.

Phillida had never looked so old. Her skin seemed drawn tight across the bones of her face, the lines etched deep. 'I'm sorry,' she said. 'Believe me. When we - George and I - volunteered for Paradoxa's programme, we knew it would be painful. But we never dreamed how much. Neither of us had children before. Perhaps if we had, we'd have been able to anticipate how this would feel.'

'I'm a freak - an absurd experiment,' Lieserl shouted. 'A *construct*. Why did you make me human? Why not some insentient animal? Why not a Virtual?'

'Oh, you had to be human. As human as possible . . .'

'I'm human in fragments,' Lieserl said bitterly. 'In shards. Which are taken away from me as soon as they're found. That's not humanity, Phillida. It's *grotesque*.'

'I know. I'm sorry, my love. Come with me.'

'Where?'

'Outside. To the garden. I want to show you something.'

Suspicious, hostile, Lieserl allowed her mother to take her hand; but she made her fingers lie lifeless, cold in Phillida's warm grasp.

It was mid-morning now. The Sun's light flooded the garden; flowers - white and yellow - strained up towards the sky.

Lieserl looked around; the garden was empty. ‘What am I supposed to be seeing?’

Phillida, solemnly, pointed upwards.

Lieserl tilted back her head, shading her eyes to block out the Sun. The sky was a searing-blue dome, marked only by a high vapour trail and the lights of orbital habitats.

Gently, Phillida pulled Lieserl’s hand down from her face, and, cupping her chin, tipped her face flower-like towards the Sun.

The star’s light seemed to fill her head. Dazzled, she dropped her eyes and stared at Phillida through a haze of blurred, streaked retinal images. ‘The *Sun*?’

‘Lieserl, you were - constructed. You know that. You’re being forced through a human lifecycle at hundreds of times the normal pace—’

‘A year every day.’

‘Approximately, yes. But there is a purpose, Lieserl. A justification. You aren’t simply an experiment. You have a mission.’ She waved her hand at the sprawling, friendly buildings that comprised the House. ‘Most of the people here, particularly the children, don’t know anything about you, Lieserl. They have jobs, goals - lives of their own to follow. But they’re here *for* you.

‘Lieserl, the House is here to *imprint* you with humanity. Your experiences have been designed - George and I were selected, even - to ensure that the first few days of your existence would be as *human* as possible.’

‘*The first few days?*’ Suddenly the unknowable future was like a black wall, looming towards her; she felt as out of control of her life as if she were a counter on some immense, invisible snakes-and-ladders board. She lifted her face to the warmth of the Sun. ‘*What am I? ’*

‘You are . . . artificial, Lieserl.

‘In a few weeks your human shell will become old. You’ll be transferred into a new form . . . Your human body will be—’

‘Discarded?’

‘Lieserl, it’s so difficult. That moment will seem like a death to me. But it *won’t* be death. It will be a metamorphosis. You’ll have new powers - even your awareness will be reconstructed. Lieserl, you’ll become the most conscious entity in the Solar System . . .’

‘I don’t want that. I want to be me. I want my freedom, Phillida.’

‘No, Lieserl. You’re not free, I’m afraid; you never can be. You have a goal.’

‘What goal?’

Phillida lifted her face to the Sun once more. ‘The Sun gave us life. Without it - without the other stars - we couldn’t survive.

‘We’re a strong species. We believe we can live as long as the stars - for tens of billions of years. And perhaps even beyond that . . . If we’re allowed to. But we’ve had - *glimpses* - of the future, the far distant future. Disturbing glimpses.

‘People are starting to plan, to assure we’re granted our destiny. People are working on projects which will take millions of years to come to fruition . . . People like those working for Paradoxa.

‘Lieserl, you’re one of those projects.’

‘I don’t understand.’

Phillida took her hand, squeezed it gently; the simple human contact seemed incongruous, the garden around them transient, a chimera, before this talk of megayears and the future of the species.

‘Lieserl, something is wrong with the Sun. *You* have to find out what. The Sun is dying; something - or someone - is *killing* it.’ Phillida’s eyes were huge before her, staring, probing for understanding. ‘Don’t be afraid. My dear, you will live forever. If you want to. And you will see wonders which I can only dream of.’

Lieserl stared into her mother’s huge, weak eyes. ‘But you don’t *envy* me. Do you, Phillida?’

‘No,’ Phillida said quietly.

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2

Louise Ye Armonk stood on the weather deck of the SS *Great Britain*. From here she could see the full length of Brunel's fine steam liner: the polished deck, the skylights, the airy masts with their loops of wire rigging, the single, squat funnel amidships.

And beyond the glowing dome which sheltered the old ship, the sky of the Solar System's rim loomed like a huge, empty room.

Louise still felt a little drunk - sourly now - from the orbiting party she'd left a few minutes earlier. She subvocalized a command to send nanobots scouring through her bloodstream; she sobered up fast, with a brief shudder.

Mark Bassett Friar Armonk Wu - Louise's ex-husband - stood close by her. They'd left the *Great Northern*, with its party still in full swing, to come here, to the surface of Port Sol, in a cramped pod. Mark was dressed in a one-piece jumpsuit of some pastel fabric; the lines of his neck were long and elegant as he turned his head to survey the old ship.

Louise was glad they were alone, that none of the *Northern*'s prospective interstellar colonists had decided to follow them down for a last few moments on this outpost of Sol, to reminisce with this fragment of Earth's past - even though reminiscence was part of the reason Louise had had the old ship brought out here in the first place.

Mark touched her arm; his palm, through the thin fabric of her sleeve, felt warm, alive. 'You're not happy, are you? Even at a moment like this. Your greatest triumph.'

She searched his face, seeking out his meaning. He wore his hair shaven, so that his fine, fragile-looking skull showed through his dark skin; his nose was sharp, his lips thin, and his blue eyes - striking in that dark face - were surrounded by a mesh of wrinkles. He'd once told her he'd thought of getting the wrinkles smoothed out - it would be easy enough in the course of AS-RENEWAL - but she'd campaigned against it. Not that she'd have cared too much, but it would have taken most of the character out of that elegant face - most of its patina of *time*, she thought.

'I never could read you,' she said at last. 'Maybe that's why we failed in the end.'

He laughed lightly, a sparkle of intoxication still in his voice. ‘Oh, come on. We lasted twenty years. That’s not a failure.’

‘In a lifetime of *two hundred* years?’ She shook her head. ‘Look. You ask me about my feelings. Anyone who didn’t know you - us - would think you cared. So why do I think that, in some part of your head, you’re laughing at me?’

Mark drew his hand away from her arm, and she could almost see the shutters coming down behind his eyes. ‘Because you’re an ill-tempered, morose, graceless - oh, into Lethe with it.’

‘Anyway, you’re right,’ Louise said at last.

‘What?’

‘I’m not happy. Although I’m not sure I could tell you why.’

Mark smiled; the sourceless light of the *Britain*’s dome smoothed away the lines around his eyes. ‘Well, if we’re being honest with each other for once, I *do* kind of enjoy seeing you suffer. Just a bit. But I care as well. Come on, let’s walk.’

He took her arm again, and they walked along the ship’s starboard side. The soles of their shoes made soft sucking sounds as the shoes’ limited processors made the soles adhere to and release the deck surface, unobtrusively reinforcing Port Sol’s microgravity. The shoes almost got it right; Louise felt herself stumble only a couple of times.

Around the ship was a dome of semisentient glass, and beyond the dome - beyond the pool of sourceless light which bathed the liner - the landscape of Port Sol stretched to its close-crowding horizon. Port Sol was a hundred-mile ball of friable rock and water-ice, with traces of hydrogen, helium and a few hydrocarbons. It was like a huge comet nucleus. Port Sol’s truncated landscape was filled with insubstantial, gossamer forms: sculptures raised from the ancient ice by natural forces reduced to geological slowness by the immense distance of the Sun.

Port Sol was a *Kuiper object*. With uncounted companions, it circled the Sun beyond the orbit of Pluto, shepherded there by resonances of the major planets’ gravitational fields.

Louise looked back at the *Great Britain*. Even against the faery background of Port Sol, still Brunel’s ship struck her as a thing of lightness, grace and elegance. She remembered going to see the ship in her dry dock on Earth; now, as then, she compressed her eyes, squinting, trying to make

out the *form* of the thing - the Platonic ideal within the iron, which poor old Isambard had tried to make real. The ship was three thousand tons of iron and wood, but with her slim, sharp curves and fine detail she was like a craft out of fantasy. Louise thought of the gilded decorations and the coat-of-arms figurehead around the stern, and the simple, affecting symbols of Victorian industry carved into the bow: the coil of rope, the cogwheels, the set-square, the wheatsheaf. It was impossible to imagine such a delicate thing braving the storms of the Atlantic . . .

She tilted back her head, and looked for the brightish star in Capricorn that was Sol, all of four billion miles away. Surely even a visionary like old Isambard never imagined that his first great ship would make her final voyage across such an immense sea as this.

Mark and Louise climbed down a steep staircase amidships to the promenade deck; they strolled along the deck past blocks of tiny cabins towards the engine-room bulkhead.

Mark ran a fingertip over the surface of a cabin wall as they passed. He frowned, rubbing his fingertips together. ‘The surface feels odd . . . not much like wood.’

‘It’s preserved. Within a thin shell of semisentient plastic, which seals it, nourishes it . . . Mark, the damn boat was launched in 1843. Over two thousand years ago. There wouldn’t be much left of her without preservation. Anyway, I thought you weren’t interested.’

He sniffed. ‘Not really. I’m more interested in why you wanted to come down here: now, in the middle of all the celebrations for the completion of the starship.’

‘I try to avoid introspection,’ she said heavily.

‘Oh, sure.’ He turned to her, his face picking up the soft glow of the ancient wood. ‘Talk to me, Louise. The bit of me that cares about you is outvoting the bit that enjoys seeing you suffer, just for the moment.’

She shrugged. She couldn’t help sounding sour. ‘You tell me. You always were good at diagnosing the condition of the inside of my head. At great and tedious length. Maybe I’m feeling melancholy after completing my work on the *Northern*. Could that be it, do you think? Maybe I’m going through some equivalent of a post-coital depression.

He snorted. ‘With you, it was post, pre and during, frankly. No, I don’t think it’s that . . . And besides,’ he said slowly, ‘your work on the *Northern*

isn’t finished yet. *You’re planning to leave with her*. Aren’t you? Spend subjective decades hauling her out to Tau Ceti.’

She heard herself growl. ‘How did you find out about that? No wonder you drove me crazy, all those years. You’re too damn *interested* in me.’

‘I’m right, though, aren’t I?’

Now they reached the *Britain*’s dining room. It was a fantastic Victorian dream. Twelve columns of white and gold, with ornamental capitals, ran down its spine, and the room was lined by two sets of twelve more columns each. Doorways between the columns led off to passageways and bedrooms, and the door archways were gilded and surmounted by medallion heads. The walls were lemon-yellow, relieved by blue, white and gold; omnipresent, sourceless light shone from the cutlery and glassware on the three long tables.

Mark walked across the carpet and ran his hand over a table’s gleaming, polished surface. ‘You should do something about this semisentient plastic: have it give the surfaces some semblance of their natural texture. The touch is half the beauty of a thing, Louise. But you always were . . . *remote*, weren’t you? Happy enough with the surface of things - with their look, their outer form. Never interested in touching, in getting closer.’

She ignored that. ‘Brunel had a lot of style, you know. He worked on a tunnel under the Thames, with his father.’

‘Where?’ Mark had been born in Port Cassini, Titan.

‘The Thames. A river, in England . . . on Earth. The tunnel was flooded, several times. Once, when it had been pumped out, Brunel threw a dinner party right up against the working face for fifty people. He got the band of the Coldstream Guards to—’

‘Hmm. How interesting,’ Mark said dryly. ‘Maybe you should put some food on these tables. Why not? It could be preserved, by your sentient plastic. You could have segments of dead animals. As devoured by the great Brunel himself.’

‘You never did have any taste, Mark’

‘I don’t think your mood has anything to do with the completion of the *Northern*.’

‘Then what?’

He sighed. ‘It’s you, of course. It always is. For a long time, while we were together, I thought I understood your motivation. There would always

be another huge, beautiful GUTship to build; another immense undertaking to lose yourself in. And since we're all immortal now, thanks to AntiSenescence, I thought that would be enough for you.

'But I was wrong. It isn't like that. Not really.'

Louise was aware of intense discomfort, somewhere deep within her; she felt she wanted to talk, read a bookslate, bury herself in a Virtual - anything to drown out his words.

'You always were smarter than me, Mark.'

'In some ways, yes.'

'Just say what you've got to say, and get it over.'

'You want immortality, Louise. But not the dreary *literal* immortality of AS - not just a body-scouring every few years - but the kind of immortality attained by your idols.' He waved a hand. 'By Brunel, for instance. By achieving something unique, wonderful. And you fear you'll never be able to, no matter how many starships you build.'

'You're damn patronizing,' she snapped. 'The *Northern* is a great achievement.'

'I know it is. I'm not denying it.' He smiled, triumph in his eyes. 'But I'm right, aren't I?'

She felt deflated. 'You know you are. Damn you.' She rubbed her eyes. '*It's the shadow of the future, Mark . . .*'

A century and a half earlier, the future had invaded the Solar System.

It had been humanity's own fault; everyone recognized that. Under the leadership of an engineer called Michael Poole the Interface project - a wormhole link to a future a millennium and a half ahead - had been completed.

At the time Louise Ye Armonk was well established in her chosen field of GUTship engineering . . . at least, as established as any mere fifty-year-old could be, in a society increasingly dominated by the AS-preserved giants of the recent past. Louise had even worked, briefly, with Michael Poole himself.

Why had Poole's wormhole time link been built? There were endless justifications - *what power could a glimpse of the future afford*? - but the truth was, Louise knew, that it had been built for little more than the sheer *joy* of it.

The Interface project came at the end of centuries of expansion for mankind. The Solar System had been opened up, first by GUTdrive vessels and later by wormhole links, and the first GUTdrive starship fuelling port - Port Sol - was already operational.

It was difficult now to recapture the mood of those times, Louise thought. Confidence - arrogance . . . The anthropic theories of cosmological evolution were somewhere near their paradigmatic peak. Some people believed humans were alone in the Universe. Others even believed the Universe had been *designed*, by some offstage agency, with the sole object of delivering and supporting humans. Given time, humans would do anything, go anywhere, achieve whatever they liked.

But Poole's Interface had been a bridge to the *real* future.

The incident that followed the opening of the wormhole had been confused, chaotic, difficult to disentangle. But it *had* been a war - brief, spectacular, like no battle fought in Solar space before or since, but a war nevertheless.

Future Earth - at the other end of Poole's time bridge, a millennium and a half hence - would be under occupation, by an alien species about whom nothing was known save their name: *Qax.*

Rebel humans from the occupation era were pursued back through time, through Poole's Interface, by two immense Qax warships. The rebels, with the help of Michael Poole, had destroyed the warships. Then Poole had driven a captured warship into the Interface wormhole, to seal it against further invasion - and in the process Poole himself was lost in time. The rebels, stranded in their past, had fled the Solar System in a captured GUTdrive ship, evidently intending to use time dilation effects to erode away the years back to their own era.

The System, stunned, slowly recovered.

Various bodies - like the Paradoxa Collegiate - still, after a hundred and fifty years, combed through the fragments of data from the Interface incident, trying to answer the unanswerable.

Like: what had *truly* happened to Michael Poole?

It was known that the Qax occupation itself would eventually be lifted, and humanity would resume its expansion - but now more warily, and into a Universe known to be populated by hostile competitors . . .

A Universe containing, above all, the *Xeelee*. And it was said that before Poole's wormhole path to the future finally closed, some information had been obtained on the far future - of millions of years hence, far beyond the era of the Qax. Louise could see how some such data could be obtained - by the flux of high-energy particles from the mouth of the collapsing wormhole, for instance.

And the rumours said that the far future - and what it held for mankind - were bleak indeed.

Louise and Mark stood on the forecastle deck and looked up towards the Sun.

The *Great Northern*, Louise's GUTdrive starship, passed serenely over their heads, following its stately, four-hour orbit through the Kuiper object's shallow gravitational well. The *Northern*'s three-mile-long spine, encrusted with sensors, looked as if it had been carved from glass. The GUTdrive was embedded in a block of Port Sol ice, a silvery, irregular mass at one end of the spine. The lifedome - itself a mile across - was a skull of glass, fixed to the spine's other end. Lights shone from the lifedome, green and blue; the dome looked like a bowlful of Earth, here on the rim of the System.

'It's beautiful,' Mark said. 'Like a Virtual. It's hard to believe it's real.' The light from the *Britain*'s dome underlit his face, throwing the fine lines around his mouth into relief. 'And it's a good name, Louise. *Great Northern*. Your starship will head out where every direction is *north* - away from the Sun.'

Staring up at the shimmering *Northern* now, Louise remembered Virtual journeys through ghostly, still-born craft: craft which had evolved around her as the design software responded to her thoughts. How Brunel would have thrived with modern software, which once again enabled the vision of individuals to dominate such huge engineering projects. And some of those lost ships had been far more elegant and daring than the final design - which had been, as ever, a compromise between vision and economics.

. . . And that was the trouble. The real thing was *always* a disappointment.

'Louise, you shouldn't fear the future,' Mark said.

Instantly Louise was irritated. 'I don't *fear* it,' she said. 'Lethe, don't you even understand that? It's Michael Poole and his damn Interface incident. I don't fear the future. The trouble is, I *know* it.'

‘We all do, Louise,’ Mark said, his patience starting to sound a little strained. ‘And most of us don’t let it affect us—’

‘Oh, really. Look at yourself, Mark. What about your *hair*, for instance? - or rather, your lack of it.’

Mark ran a self-conscious hand up and over his scalp.

She went on, ‘Everyone knows that this modern passion for baldness comes from those weird human rebels from the future, the Friends of Wigner. So you can’t tell me you’re not influenced by knowing what’s to come. Your very hairstyle is a statement of—’

‘All right,’ he snapped. ‘All right, you’ve made your point. You never know when to shut up, do you? But, Louise - the difference is we aren’t all *obsessed* by the future. Unlike you.’

He walked away from her, his gait stiff with annoyance.

They climbed down into the engine room. Multicoloured light filtered down through an immense skylight. Four inclined cylinders thrust up from the floor of the ship; the pistons stood idle like the limbs of iron giants, and a vast chain girdled the drive machinery.

Louise rubbed her chin and stared at the machinery. ‘Obsessed? Mark, the future contains the Xeelee - godlike entities so aloof from us that we may never understand what they are trying to achieve - and with technology, with *engineering*, like magic. They have a *hyperdrive*.’ She let her voice soften. ‘Do you understand what that means? It means that somewhere in the Universe, *now*, the damn Xeelee are riding around in FTL chariots which make my poor *Northern* look like a horse-drawn cart.

‘And we believe they have an intraSystem engine - their so-called *discontinuity drive* - which powers night-dark ships with wings like sycamore leaves, hundreds of miles wide . . .

‘I’m not denying my GUTdrive module is a beautiful piece of engineering. I’m *proud* of it. But compared to what we understand of Xeelee technology, Mark, it’s - it’s a damn steam engine. Why, we even use ice as reaction mass. Think of that! What’s the point of building something which I know is outdated before I even start?’

Mark laid a hand on her shoulder and squeezed. His touch was warm, firm, and - as he’d no doubt intended - disconcertingly intimate. ‘So that’s why you’re running away.’

‘I’d hardly call leaving on a one-way colonizing expedition to Tau Ceti “running away”.’

‘Of course it is. *Here* is where you can achieve things - here, with the resources of a Solar System. You’re an engineer, damn it. What will you build on some planet of Tau Ceti? A *real* steam engine, maybe.’

‘But—’ She struggled to find words that didn’t sound, even to her, like self-justifying whines. ‘But maybe that would count for more, in the greater scheme of things, even than a dozen bigger and better *Northerns*. Do you see?’

‘Not really.’ His voice sounded flat, tired; perhaps he was letting himself sober up.

They stood for a while, in a silence broken only by their breathing. Then he said, ‘I’m sorry, Louise. I’m sorry you’re letting such moods spoil your night of triumph. But I’ve had enough; I feel as if I’ve been listening to that stuff for half my life.’

As usual when his mood turned like this, she was filled with regret. She tried to cover his hand, which still lay on her shoulder. ‘Mark—’

He slid his hand away. ‘I’m going back to the pod, and up to the ship, and I’m going to get a little more drunk Do you want to come?’

She thought about it. ‘No. Send the pod down again. Some of the cabins here are made up; I can—’

There was a sparkling in the air before him. She stumbled back, disconcerted; Mark moved closer to her to watch.

Pixels - thumbnail cubes of light - tumbled over each other, casting glittering highlights from Brunel’s ancient machinery. They coalesced abruptly into the lifesize, semitransparent Virtual image of a human head: round, bald, cheerful. The face split into a grin. ‘Louise. Sorry to disturb you.’

‘Gillibrand. What in Lethe do *you* want? I thought you’d be unconscious by now.’

Sam Gillibrand, forty going on a hundred and fifty, was Louise’s chief assistant. ‘I was. But my nanobots were hooked up to the comms panel; they sobered me up fast when the message came in. Damn them.’ Gillibrand looked cheerful enough. ‘Oh, well; I’ll just have it all to do again, and—’

‘The comms panel? What was the message, Sam?’

Gillibrand’s grin became uncertain. ‘City Hall. There’s been a change to the flight plan.’ Gillibrand’s voice was high; heavily accented mid-American, and not really capable of conveying much drama. And yet Louise felt herself shudder when Gillibrand said: ‘We’re not going to Tau Ceti after all.’

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3

The old woman leaned forward in her seat, beside Kevan Scholes.

The surface of the Sun, barely ten thousand miles below the clear-walled cabin of the *Lightrider*, was a floor across the Universe. The photosphere was a landscape, encrusted by granules each large enough to swallow the Earth, and with the chromosphere - the thousand-mile-thick outer atmosphere - a thin haze above it all.

Scholes couldn't help but stare at his companion. Her posture was stiff, and her hands - neatly folded in her lap, over her seatbelt - were gaunt, the skin pocked by liver-spots and hanging loosely from the bones. *Like gloves*, he thought. She wore a simple silver-grey coverall whose only decoration was a small brooch pinned to the breast. The brooch depicted a stylized snake entwined around a golden ladder.

The little ship passed over a photosphere granule; Scholes watched absently as it unfolded beneath them. Hot hydrogen welled up from the Solar interior at a speed of half a mile a second, then spread out across the photosphere surface. This particular fount of gas was perhaps a thousand miles across, and, in its photosphere-hugging orbit, the *Lightrider* was travelling so rapidly that it had passed over the granule in a few minutes. And Scholes saw as he looked back that the granule was already beginning to disintegrate, the hydrogen spill at its heart dwindling. Individual granules persisted less than ten minutes, on average.

'How beautiful this is,' his companion said, gazing down at the Sunscape. 'And how *complex* - how intricate, like some immense machine, perhaps, or even a world.' She turned to him, her mouth - surrounded by its dense web of wrinkles - folded tight. 'I can imagine whiling away my life, just watching the slow evolutions of that surface.'

Scholes looked across the teeming Sunscape. The photosphere was a mass of ponderous motion, resembling the surface of a slowly boiling liquid. The granules, individual convective cells, were themselves grouped into loose associations: *supergranules*, tens of thousands of miles across, roughly bounded by thin, shifting walls of stable gas. As he watched, one granule exploded, its material bursting suddenly across the Solar surface; neighbouring granules were pushed aside, so that a glowing, unstructured

scar was left on the photosphere, a scar which was slowly healed by the eruption of new granules.

Scholes studied his companion. The sunlight underlit her face, deepening the lines and folds of loose flesh there. It made her look almost demonic - or like something out of a distant, unlamented past. She'd fallen silent now, watching him; some response was expected, and he sensed that his customary glib flippancy - which usually passed for conversation in the Solar habitat - wouldn't do.

Not for her.

He summoned up a smile, with some difficulty. 'Yes, it's beautiful. But —' Scholes had spent much of the last five years within a million miles of the Sun's glowing surface, but even so had barely started to become accustomed to the eternal presence of the star. 'It's impossible to forget it's *there* . . . Even when I'm in Thoth, with the walls opaqued - when I could really be anywhere in the System, I guess.' He hesitated, suddenly embarrassed; her cold, rheumy eyes were on him, analytical. 'I'm sorry. I don't know how to explain it any better.'

Was there a hint of a smile on that devastated face? 'You needn't be self-conscious.'

Kevan Scholes had volunteered for this assignment - a simple three-hour orbital tour with this mysterious woman who, a few days earlier, had been brought to Thoth, the freefall habitat at the centre of the wormhole project. It should have been little more than a sightseeing jaunt - and a chance to learn more about this ancient woman, and perhaps about the true goals of Paradoxa's wormhole project itself.

And besides, it was a break from his own work. Scholes was supervising the assembly of one vertex of a wormhole Interface from exotic matter components. When the wormhole was complete, one of its pair of tetrahedral Interfaces would be left in close orbit around the Sun. The other, packed with an ambitious AI complex, would be dropped into the Sun itself.

The work was well paid, though demanding; but it was dull, routine, lacking fulfilment. So a break was welcome . . . But he had not expected to be so disconcerted by this extraordinary woman.

He tried again. 'You see, we're all scientists or engineers here,' he said. 'A sense of wonder isn't a prerequisite for a job on this project - it's probably a handicap, actually. But that's a *star* out there, after all: nearly a

million miles across - *five light-seconds* - and with the mass of three hundred thousand Earths. Even when I can't see it, I know it's there; it's like a psychic pressure, perhaps.'

She nodded and turned her face to the Sun once more. 'Which is why we find speculation about its destruction so extraordinarily distressing. And, of course, to some extent we are actually *within* the body of the Sun itself. Isn't that true?'

'I guess so. There's no simple definition of where the Sun ends; there's just a fall-off of density, steep at first, then becoming less dramatic once you're outside the photosphere . . . Let me show you.'

He touched his data slate, and the semisentient hull suppressed the photosphere's glow. In its new false colours the Sunscape became suffused with deep crimsons and purples; the granules seethed like the clustering mouths of undersea volcanoes.

'My word,' she murmured. 'It's like a landscape from a medieval hell.'

'Look up,' Scholes said.

She did so, and gasped.

The chromosphere was a soft, featureless mist around the ship. And the corona - the Sun's outer atmosphere, extending many Solar diameters beyond the photosphere - was a cathedral of gas above them, easily visible now that the photosphere light was suppressed. There were ribbons, streamers of high density in that gas; it was like an immense, slow explosion all around them, expanding as if to fill space.

'There's so much *structure*,' she said. She stared upwards, her watery eyes wide and unblinking. Scholes felt disquieted by her intensity. He restored the transparency of the hull, so that the corona was overwhelmed once more.

A sunspot - deep black at its heart, giving an impression of a wound in the Sun's hide, of immense depth - unfolded beneath them, ponderously.

'We seem to be travelling so *slowly*,' she said.

He smiled. 'We're in free orbit around the Sun. We're actually travelling at three hundred miles a *second*.'

He saw her eyes widen.

He said gently, 'I know. It takes a little while to get used to the *scale* of the Sun. It's not a planet. If the Earth were at the centre of the Sun, the whole of the Moon's orbit would be contained within the Sun's bulk . . .'

They were directly over the spot now; its central umbra was like a wound in the Sun's glowing flesh, deep black, with the penumbra a wide, grey bruise around it. This was the largest of a small, interconnected family of spots, Scholes saw now; they looked like splashes of paint against the photosphere, and their penumbrae were linked by causeways of greyness. The spot complex passed beneath them, a landscape wrought in shades of grey.

'It's like a tunnel,' Lieserl said. 'I imagine I can see into it, right down into the heart of the Sun.'

'That's an illusion, I'm afraid. The spot is dark only by contrast with the surrounding regions. If a major spot complex could be cut out of the Sun and left hanging in space, it would be as bright as the full Moon, seen from Earth.'

'But still, the illusion of depth is startling.'

Now the spot complex was passing beneath them, rapidly becoming foreshortened.

Scholes said uncertainly, 'Of course you understand that what you see of the Sun, here, is a false-colour rendering by the hull of the *Lightrider*. The '*Rider*'s hull is actually almost perfectly reflective. Excess heat is dumped into space with high-energy lasers fixed to the hull: the '*Rider* refrigerates itself, effectively. In fact, if you could see the ship from outside it would actually be glowing more brightly than the photosphere itself . . .' Scholes was uncomfortably aware that he was jabbering.

'I think I follow.' She waved her claw-like hand, delicately, at the glowing surface. 'But the features are real, of course. Like the spot complex.'

'Yes. Yes, of course.' *Lethe*, he thought suddenly. *Am I patronizing her*?

His brief had been to show this strange old woman the sights - to give her the VIP tour. But he knew nothing about her - it was quite possible she knew far more about the subjects he was describing than he did.

The Paradoxa Collegiate was notoriously secretive: about the goals of this Solar wormhole project, and the role the old woman would play in it . . . although everyone knew, from the way she had been handled since arriving in near-Solar space - as if she was as fragile and precious as an eggshell - that this woman was somehow the key to the whole thing.

But how much did she *know*?

He watched her birdlike face carefully. The way her grey hair had been swept back into a small, hard bun made her strong-nosed face even more gaunt and threatening than it might otherwise have been.

She asked, ‘And is this refrigeration process how the wormhole probe is going to work - to become able to penetrate the Sun itself?’

He hesitated. ‘Something like it, yes. The key to refrigerating a volume is to suck heat out of the volume faster than it’s allowed in. We’ll be taking Solar heat away from the AI complex out through the wormhole, and dumping it outside the Sun itself; actually we’re planning to use that energy as a secondary power source for Thoth . . .’

She shifted in her chair, stiff and cautious, as if afraid of breaking something. ‘Dr Scholes, tell me. Will we be leaving freefall?’

The question was surprising. He looked at her. ‘During this flight, in the *Lightrider*?’

She returned his look calmly, waiting.

‘We’re actually in free orbit around the Sun; this close to the surface the period is about three hours . . . We’ll make a complete orbit. Then we’ll climb back out to Thoth . . . But we’ll proceed the whole way at low acceleration; you should barely feel a thing. Why do you ask?’ He hesitated. ‘Are you uncomfortable? ’

‘No. But I would be if we started to ramp up the gees. I’m a little more fragile than I used to be, you see.’ Her tone was baffling - self-deprecating, wistful, perhaps with a hint of resentment.

He nodded and turned away, unsure how to respond.

‘Oh, dear.’ Unexpectedly, she was smiling, revealing small, yellow-gold teeth. ‘I’m sorry, Dr Scholes. I suspect I’m intimidating you.’

‘A little, yes.’ He grinned.

‘You really don’t know what to make of me, do you?’

He spread his hands. ‘The trouble is, frankly, I’m not sure how much you know.’ He hesitated. ‘I don’t want to feel I’m patronizing you, by—’

‘Don’t feel that.’ Unexpectedly she let her hand rest on his; her fingers felt like dried twigs, but her palm was surprisingly warm, leathery. ‘You’re fulfilling the request I made, for this trip, very well. Assume I know nothing; you can treat me as an empty-headed tourist.’ Her smile turned into a grin, almost mischievous; suddenly she seemed much less *alien*, in

Scholes' eyes. 'As ignorant as a visiting politician, or Paradoxa high-up, even. Tell me about sunspots, for instance.'

He laughed. 'All right . . . To understand that, you need to know how the Sun is put together.'

The Sun was a thing of layers, like a Chinese box.

At the Sun's heart was an immense fusion reactor, extending across two hundred thousand miles. This core region - contained within just a quarter of the Sun's diameter - provided nearly all the Sun's luminosity, the energy which caused the Sun to shine.

Beyond the fusing core, the Sun consisted of a thinning plasma. Photons - packets of radiation emitted from the core - worked their way through this radiative layer, on average travelling no more than an inch before bouncing off a nucleus or electron. It could take an individual photon millions of years to work its way through the crowd to the surface of the Sun.

Moving outwards from the core, the density, temperature and pressure of the plasma fell steadily, until at last - four-fifths of the way to the surface - electrons could cling to nuclei to form atoms - and, unlike the bare nuclei of the plasma, the atoms were able to *absorb* the energy of the photons.

It was as if the photons, after struggling out from the fusing centre, had hit a brick wall. All of their energy was dumped into the atoms. The gas above the wall responded - like a pan of water heated from below - by *convecting*, with hot material rising and dragging down cooler material from above.

The wormhole probe, with its fragile cargo, would be able to penetrate as far as the bottom of this convective zone, twenty per cent of the way towards the centre of the Sun.

She nodded. 'And the photosphere which we see, with its granules and supergranules, is essentially the top layer of the convective zone. It's like the surface of your pan of boiling water.'

'Yes. And it's the properties of the material in the convective zone that cause sunspots.'

The convective zone matter was highly charged. The Sun's magnetic field was intense, and its flux tubes, each a hundred yards across, became locked into the charged material.

The Sun's rotation spread the frozen-in flux lines, stretching them around the Sun's interior like bands of elastic. The tubes became tangled

into ropes, disturbed by bubbles of rising gas and twisted by convection. Kinks in the tangled ropes became buoyant enough to float up to the surface and spread out, causing spots and spot groups.

She smiled as he spoke. ‘You know, I feel as if I’m returning to my childhood. I studied Solar physics intensely,’ she said. ‘And a lot else, besides. I remember doing it. But . . .’ She sighed. ‘I seem to retain less and less.

‘The Sun is my life’s work, you see, Dr Scholes. I’ve known that since I was born. I once knew much about the Sun. And in the future,’ she went on ambiguously, ‘I shall once again know a great deal. More, perhaps, than anyone who has yet lived.’

He decided to be honest with her. ‘That doesn’t make a lot of sense.’

‘No. No, I don’t suppose it does,’ she said sharply. ‘But that doesn’t matter, Dr Scholes. Your brief is to do just what you’ve been doing: to show me the sights, to let me *feel* the Sun from a human perspective.’

A human perspective?

Now she turned and looked directly into his eyes; her gaze, watery as it was, was open and disconcerting, searing. ‘But your curiosity about my role isn’t what’s throwing you off balance. Is it?’

‘I—’

‘It’s my *age*.’ She grinned again, deliberately - it seemed to him - showing her grotesque, yellowed teeth. ‘I’ve seen you studying me, from the corner of your eye . . . Don’t worry, Kevan Scholes, I don’t take offence. My age is the subject you’ve been politely skirting since I climbed aboard this flying refrigerator of yours.’

He felt resentful. ‘You’re mocking me.’

She snorted. ‘Of course I am. But it’s the truth, isn’t it?’

He tried not to let his anger build. ‘What reaction do you expect?’

‘Ah . . . honesty at last. I expect nothing less than your rather morbid fascination, of course.’ She raised her hands and studied them, as if they were artifacts separate from her body; she turned them around, flexing her fingers. ‘How awful it is that this *ageing* was once the lot of all of humanity, this slow disintegration into decay, physical and mental. Especially the physical, actually . . . My body seems to crowd out my awareness; sometimes I’ve time for nothing else but to cater to its pressing, undignified needs . . .’ She frowned. ‘But perhaps AS treatment has robbed

our species of rather more than it has given us. After all, even the most vain, or most attention-seeking, refuse to be AS-frozen at more than, say, physical-sixty. So meaningful interaction is restricted to a physical range of a mere six decades. How sad.'

He took a breath. 'But you must be - physical-eighty?'

Her mouth twitched. 'That's not a bad guess, for someone who's never met an *old* person before . . . unless you've ever encountered an unfortunate individual for whom AS treatment has failed to take. These are humans in their natural state, if you think about it, but our society treats them as ill - to be feared, shunned.'

Gently, he asked, 'Is that what's happened to you?'

'Failed AS treatments?' Her papery cheeks trembled briefly, and again he perceived resentment, a deep anger, just under her abrasive, disconcerting surface. 'No. Not exactly.'

He touched her arm. 'Look there . . . ahead of us.'

There was a structure before them, looming out of the flat-infinite horizon, rising from the photosphere itself. It was like a viaduct - a series of arches, loops of crimson-glowing gas which strode across the Solar surface.

Once again he heard her gasp.

He checked his data slate. 'Prominences. The whole structure is a hundred thousand miles long, twenty thousand high . . .' He glanced up and checked their heading. 'We're only ten thousand miles above the surface ourselves. We're going to pass *through* one of those arches.'

She clapped her hands in delight, and suddenly she seemed astonishingly, unnervingly young - a child trapped in a decaying husk of a body, he thought.

Soon the arch through which they would pass was huge before them, and the mouths of the others began to close up, foreshortened. In this landscape of giants, Scholes found he had trouble visualizing the scale of the structures; their approach seemed to take forever, yet still they grew, thrusting out of the Sun like the dreams of some insane engineer. Now he could make out detail - there were places were the arch was not complete, and he could see knots of higher density in the coronal gas which flowed, glowing, down the magnetically shaped flanks towards pools of light at the feet of the arch. But despite all this the illusion of artifice persisted, making the structure still more intimidating.

At last the arch swept over them, immense, aloof, grand.

‘Five thousand miles thick,’ he said slowly. ‘Just think; you could hang the Earth up there, at the apex of that arch, like a Christmas tree ornament.’

She snorted, and pressed the back of her hand to her mouth.

He looked at her curiously. She was - he realized slowly - *giggling.*

They passed through the arch; the vast sculpture of gas receded slowly behind them.

Scholes checked his data slate. ‘We’ve almost completed our orbit. Three million miles of a Solar great circle traversed in three hours . . .’

‘So our journey’s nearly done.’ She folded her hands neatly in her lap once more, and turned her face to the clear wall; corona light played around her profile, making her look remote, surprisingly young.

He felt suddenly moved by her - by this lonely, bitter woman, isolated by her age and fragility from the rest of mankind . . . and, he suspected obscurely, isolated by some much more dramatic secret.

He tried to reassure her. ‘Another hour and you’ll be safely inside the habitat. You’ll be a lot more comfortable there. And—’

She turned to him. She wasn’t smiling, but her face seemed to have softened a little, as if she understood what he was trying to do. Again she reached out and touched the back of his hand, and the sudden human contact was electric. ‘Thank you for your patience, Dr Scholes. I’ve not given you an easy time, have I?’

He frowned, troubled. ‘I don’t think I’ve been patient at all, actually.’

‘Oh, but you have.’

His curiosity burned within him, like the Sun’s fusion core, illuminating everything he saw. ‘You’re at the heart of all this, aren’t you? The Paradoxa project, I mean. I don’t understand what your role is . . . But that’s the truth, isn’t it?’

She said nothing, but let her hand remain on his.

He frowned. She seemed so *fragile*. ‘And how do you feel about it?’

‘How do I *feel* ?’ She closed her eyes. ‘Do you know, I’m not sure if anyone has asked me that before. How do I feel?’ She sighed, raggedly. ‘I’m scared, Dr Scholes. *That’s* how I feel.’

He let his fingers close around hers.

There was a subtle push in the base of his spine, and the sound of the *Lightrider*’s drive was a deep, low vibration, a seismic rumble he felt deep

within the fabric of his body.

Slowly, the little ship climbed away from the Sun’s boiling surface.

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4

The flitter tumbled from the shimmering throat of the wormhole transit route from Port Sol to Earthport. Louise Ye Armonk peered out of the cramped cabin, looking for Earth. Mark sat beside her, a bookslate on his lap.

Earthport was a swarm of wormhole Interfaces clustered at L4 - one of the five gravitationally stable Lagrange points in the Earth-Moon system, leading the Moon in its orbit around Earth by sixty degrees. From here, Earth was a swollen blue disc; wormhole gates of all sizes drifted across the face of the old planet like electric-blue, tetrahedral snowflakes.

The flitter - unmanned save for its two passengers - surged unhesitatingly through the tangle of Interfaces, the mesh of traffic which passed endlessly through the great cross-System gateways. In contrast to the desolation of the outer rim, Louise received a powerful, immediate impression of bustle, prosperity, activity, here at the heart of the System.

At the flitter's standard one-gee acceleration the final leg from L4 to Earth itself would take only six hours; and already the old planet, pregnant and green, seemed to Louise to be approaching rapidly, as if surfacing through the complex web of wormhole Interfaces. Huge fusion stations - constructed from ice moons towed into Earth orbit from the asteroid belt and beyond - sparkled as they crawled above green-blue oceans. The planet itself was laced with lights, on land and sea. In the thin rim of atmosphere near the North Pole Louise could just make out the dull purple glow of an immense radiator beam, a diffuse refrigerating laser dumping a fraction of Earth's waste heat into the endless sink of space.

Louise felt an absurd, sentimental lump rise to her throat as she studied the slowly turning planet. At moments like this she felt impelled to make private vows about spending more time here: *here*, at the vital core of the System, rather than on its desolate edge.

. . . But, she reminded herself harshly, the rim was where the *Northern* was being built.

Louise had work to do. She was trying to equip a starship, damn it. She didn't have the time or energy to hop back to Earth to play guessing games with some unseen authority.

Growling subvocally, Louise rested her head against her couch and tried to sleep. Mark, patient and placid, called a new page of his bookslate.

The little ship landed in North America, barely thirteen hours after leaving Port Sol - all of four billion miles away. The flitter brought them to a small landing pad near the heart of Central Park, New York City. Through her window Louise saw two people - a man and a woman - approaching the pad across the crisp grass.

The flitter's autopilot told them to make their way to a small, anonymous-grey building close to the pad.

Louise and Mark emerged into the sunshine of a New York spring. Louise could see the shoulders of tall, ancient skyscrapers at the rim of the park, interlaced by darting flitters. Not far away, shielded by trees at the heart of the park, she made out one of the city's carbon-sequestration domes. The dome was a sphere of dry ice four hundred yards tall: sequestration was an old Paradoxa scheme, with each dome containing fifty million tons of carbon dioxide boldly frozen out of the atmosphere and lagged by a two-yard layer of rock wool.

Mark raised his face to the Sun and breathed deeply. 'Mmm. Cherry blossom and freshly cut grass. I love that smell.'

Louise snorted. 'Really? I didn't know cherry trees grew wild, on Titan.'

'We have domes,' he said defensively. 'Anyway, every human is allowed to be sentimental about a spring day in New York. Look at those clouds, Louise. Aren't they beautiful?'

She looked up. The sky was laced by high, fluffy, dark clouds. And beyond the clouds she saw crawling points of light: the habitats and factories of near-Earth space. It was a fine view - but quite artificial, she knew. Even the clouds were fakes: they were doped with detergent, to limit the growth of the water droplets which comprised them. Smaller droplets reflected more sunlight than larger ones, making the semi-permanent clouds an effective shield against excessive Solar heating.

So much for sentiment. Everything was manufactured.

Louise dropped her head. As always on returning to Earth, she felt disoriented by the openness of the sky above her - it seemed to counter every intuition to have to believe that a thin layer of blue air could protect her adequately from the rigours of space.

‘Come on,’ she said to Mark. ‘Let’s get this over with.’

Following the instructions of the autopilot they approached the nearby building. The structure was brick-shaped, perhaps ten feet tall; there was a low doorway in the centre of its nearest face.

As they got closer, the two people Louise had noticed from the air walked slowly towards them from the rear of the building.

The two parties stared at each other curiously.

The man stepped forward, his hands behind his back. He was thin and tall, physical-fifty, with a bald, pallid scalp fringed by white hair. He stared frankly at Louise. ‘I know your face,’ he said.

Louise let her eyebrows lift. ‘Really? And you are—’

‘My name is Uvarov. Garry Benson Deng Uvarov.’ He held out his hand; his voice had the flat, colourless intonation of the old Lunar colonies, Louise thought. ‘My field is eugenics. And my companion—’ He indicated the woman, who came forward. ‘This is Serena Milpitas.’

The woman grinned. She was plump but strong-looking, about physical-forty, with short-cropped hair. ‘That’s Serena *Harvey Gallium Harvey* Milpitas,’ she said. ‘And I’m an engineer.’

Uvarov gazed at Louise, his eyes a startling blue. ‘It’s very pleasant to meet you, Louise Ye Armonk. I’ve followed the construction of your starship with interest. But I am a busy man. I’ll be very pleased to learn why you’ve summoned us here.’

‘Me too,’ Milpitas growled. She had the lazy, nasal pitch of a Martian.

Louise felt confused. ‘Why *I* summoned you . . . ?’

Mark stepped forward and introduced himself. ‘I think you’ve got it wrong, Dr Uvarov. We don’t know any more than you do, it seems. We were summoned *too*.’

Louise stared at Uvarov, feeling an immediate dislike for the man gather in her heart. ‘Yeah. And I bet we had further to come than you, too.’

Mark looked sour. ‘First blood to you, Louise. Well done. Come on; the only way we’re all going to get away from here is to go through with this, it seems.’

Striding confidently, he led the way towards the low building.

Studying each other suspiciously, the rest followed.

Louise passed through the squat, open doorway - and was plunged immediately into the darkness of space.

She heard Mark gasp; he stopped a pace behind her, his step faltering. She turned to him. He'd raised his head to a darkened dome above them; a sliver of salmon-pink (Jovian?) cloud slid across the lip of the dome, casting a light across his face, a light which softened the shadows of his apparent age. She reached out and found his hand; it was thin, cold. 'Don't let it get to you,' she whispered. 'It's just a stunt. A Virtual trick, designed to put us off balance.'

He pulled his hand away from hers; his fingernails scratched her palm lightly. 'I know that. Lethe, you'll never learn to stop patronizing me, will you?'

She thought of apologizing, then decided to skip it.

Uvarov walked forward briskly - hoping, it seemed, to catch the Virtual projectors of this illusion off guard. But the chamber moved past him fluidly, convincingly, shadows and hidden aspects unfolding with seamless grace.

The four of them were in a dome, a half-sphere a hundred yards across. At the geometric centre of the dome were tipped-back control couches. A series of basic data entry and retrieval desks clustered around the couches. The rest of the floor area was divided by shoulder-high partitions into lab areas, a galley, a gym, a sleeping area and shower. The shower was enclosed by a spherical balloon of some clear material - obviously designed for zero-gee operation, Louise thought.

The sleeping zone contained a single sleep pouch. There was a noticeable absence of decoration - of any real sign of *personality,* Louise thought. There was no concession to comfort - no sign of entertainment areas, for example. Even the gym was functional, bare, little more than an open coffin surrounded by pneumatic weight-simulators. The only colour in the chamber came from the screens of the data desks, and from the slice of Jovian cloud visible through the dome.

Serena Milpitas strolled towards Louise, her footsteps clicking loudly on the hard floor. She ran a fingertip along the surface of a data desk. 'It's a high-quality Virtual projection, with semisentient surface backup,' she said. 'Feel it.'

'I don't need to,' Louise groused. 'I'm sure it is. That's not the bloody point. This is obviously meant to be the lifedome of a GUTship - a small,

limited, primitive design compared to my *Northern*, but a GUTship nevertheless. And—’

Light, electric-blue, flooded the dome. The explosion of brilliance was overwhelming, drenching; Louise couldn’t help but cower. Her own shadow - sharp, black, utterly artificial - seemed to peer up at her, mocking her.

She lifted her head. Beyond the transparent dome above her, an artifact - a tetrahedron glowing sky-blue - sailed past the limb of the Jovian planet. It was a framework of glowing rods: at first sight the framework looked open, but Louise could make out glimmers of elusive, brown-gold membranes of light stretched across the open faces. Those membranes held tantalizing images of starfields, of suns that had never shone over Jupiter.

‘A wormhole Interface,’ Milpitas breathed.

‘Obviously,’ Uvarov said. ‘So we’re in a Virtual GUTship, sailing towards an Interface in orbit around Jupiter.’ He turned to Louise, letting his exasperation show. ‘Haven’t you got it yet?’ He waved a hand. ‘The meaning of this ludicrous stunt?’

Louise smiled. ‘We’re in the *Hermit Crab*, aren’t we? On Michael Poole’s ship.’

‘Yes. Just before it flew into Poole’s Interface - just before Poole got himself killed.’

‘Not quite.’

The new voice came from the control couches at the heart of the lifedome. Now one of the couches spun around, slowly, and a man climbed out gracelessly. He walked towards them, emerging into the glaring blue overhead light of the Interface. He said, ‘Actually we don’t know if Poole was killed or not. He was certainly *lost*. He may still be alive - although it’s difficult to say what meaning words like “still” have when spacetime flaws spanning centuries are traversed.’

The man smiled. He was thin, tired-looking, with physical age around sixty, Louise supposed; he wore a drab one-piece coverall.

The face - the clothes - were startling in their familiarity to Louise; a hundred memories crowded, unwelcome, for her attention.

‘I know you,’ she said slowly. ‘I *remember* you; I worked with you. But you were lost in time . . .’

‘My name,’ the man said, ‘is Michael Poole.’

Lieserl wanted to die.

It was her ninetieth day of life, and she was ninety physical-years old. She was impossibly frail - unable to walk, or feed herself, or even clean herself. The faceless men and women tending her had almost left the download too late, she thought with derision; they'd already had one scare when an infection had somehow got through to her and settled into her lungs, nearly killing her.

She was *old* - physically the oldest human in the System, probably. She felt as if she was underwater: her senses had turned to mush, so that she could barely feel, or taste, or see anything, as if she was encased in some deadening, viscous fluid. And her mind was failing.

She could *feel* it, towards the end. It was like a ghastly reverse run of her accelerated childhood; she woke every day to a new diminution of her self. She came to dread sleep, yet could not avoid it.

And every day, the bed seemed too large for her.

But she retained her pride; she couldn't stand the indignity of it. She hated those who had put her into this position.

Her mother's last visit to the habitat, a few days before the download, was bizarre. Lieserl, through her ruined, rheumy old eyes, was barely able to recognize Phillida - this young, weeping woman, only a few months older than when she had held up her baby girl to the Sun.

She could not forgive her mother for the artifice of her existence - for the way understanding of her nature, even data on Paradoxa, had been *kept* from her until *others* thought she was ready.

Lieserl cursed Phillida, sent her away.

At last Lieserl was taken, in her bed, to the downloading chamber at the heart of Thoth. The chamber's lid, disturbingly coffin-like, closed over her head. She closed her eyes; she felt her own, abandoned, frail body around her.

And then—

It was a sensory explosion. It was like sleeping, then waking - no, she thought; it was more - far more than that.

The focus of her awareness remained in the same functional hospital room at the centre of the Solar habitat. She was standing, surveying the chamber - no, she realized slowly, she wasn't standing: *she had no real sensation of her body . . .*

She felt disembodied, discorporeal. She felt an instant of panic.

But that moment of fear faded rapidly, as she looked out through her new eyes.

The drab, functional chamber seemed as vivid to her as the golden day she had spent as a small child, with her parents on that remote beach, when her senses had been so acute they were almost transparent. In an instant she had become young again, with every sense alive and sharp.

And, slowly, Lieserl became aware of new senses - senses beyond the human. She could see the sparkle of X-ray photons from the Solar photosphere as they leaked through the habitat's shielding, the dull infra-red glow of the bellies and heads of the people working around the shell of her own abandoned body - and the fading sheen of that cold husk itself.

She probed inwards. She retained her memories from her old body, from prior to the downloading, she realized; but those memories were qualitatively different from the records she was accumulating now. Limited, partial, subjective, imperfectly recorded: like fading paintings, she thought.

She had died, and she was reborn. She felt pity, for the person who once called herself Lieserl.

The clarity of her new senses was remarkable. It was like being a child again. She immersed herself, joyously, in the objective reality of the Universe around her.

He - *it* - was a Virtual, of course. The realization brought Louise crushing disappointment.

Uvarov snorted. 'This is an absurdity. A pantomime. You're wasting my time here.'

The Virtual of Poole looked disconcerted; his smile faded. 'How so?'

'I've read of Michael Poole. And I know he hated Virtuals, of all kinds.' Virtual-Poole laughed. 'All right. So this simulacrum is offensive; you think Poole would have objected. Well, perhaps. But at least it's got your attention.'

Milpitas touched Uvarov's arm. 'Why are you so damn hostile, Doctor? No one's doing you any harm.'

Uvarov snatched his arm away.

'She's right.' Virtual-Poole waved a hand to the couches at the heart of the lifedome. 'Why don't you sit down? Do you want a drink; or—'

'I don't want to sit down,' Louise said icily. 'And I don't want a drink. What am I, a kid to be impressed by fireworks?' Even as she spoke, though,

she was aware that the wormhole, sliding across space above them, had frozen in its track at the moment Virtual-Poole had climbed out of his couch; exotic-energy light flooded down over the little human tableau, as if suspending them in timelessness. She felt confused, disoriented. *This isn't Michael Poole*. But all Virtuals were conscious, to some degree. *This Virtual remembers being Poole*. She wanted to lash out at it - to hurt it. 'Damn it, it would have been cheaper to take us to Jupiter itself rather than to set up this charade, here on Earth.'

'Perhaps,' Virtual-Poole said dryly. 'But this diorama isn't just for show. I have something to demonstrate to you. This setup seemed the best way to achieve that. As, if you've the patience, you'll see.'

Louise felt her jaw muscles tighten. 'Patience? I'm trying to launch a starship. I need to be at Port Sol, working on the *Northern* - not stuck here in this box in New York, talking to a damn puppet.'

Poole winced, looking genuinely hurt. Louise despised herself.

Uvarov said, 'I, too, have projects which demand my time.'

The sky-blue light cast convincing shadows over Poole's cheekbones and jaw. 'This simulation is serving several purposes. And one of those purposes is *discretion*. Look - I'm only partially self-aware. But I am autonomous, within this environment. There is no channel in or out of here; no record will exist of this conversation, unless one of you chooses to make one.'

Milpitas snorted. 'Why should we believe you? We still don't know who you represent.'

A trace of anger showed in the hardening of Virtual-Poole's mouth. 'Now *you're* being absurd. Why should I lie? Louise Ye Armonk, I have a proposal for you. A challenge - for you all, actually. You may refuse the challenge. You certainly can't be forced to accept it. And so, we meet in secrecy; if you refuse, no one will ever know.'

'Bullshit,' Uvarov growled; pink Jovian light gleamed from his bald pate.

'Let's skip the riddles and get on with it. Who's behind you, Poole?'

Briefly, Virtual-Poole looked pained - almost as if he was too tired for such confrontations. Louise remembered that although Michael Poole had accepted AS treatment, he'd persistently refused consciousness adjustment treatment. A deep dread of memory editing kept people like Poole away

from the reloading tables, even when the efficiency of their awareness - clogged by decades of memory - started to downgrade.

Virtual-Poole seemed to rouse himself. ‘Tell me what you know.’

Mark spoke up. ‘Very little. We got a call to come in here from the Port Sol authorities.’ He smiled. ‘We got the impression we didn’t have a lot of choice but to comply. But it wasn’t clear who was behind the summons, or why we were wanted.’

Milpitas and Uvarov confirmed that they, too, had received similar calls.

‘But,’ Louise said dryly, ‘it was obviously someone a bit more senior than the Port Sol harbour master.’

Virtual-Poole rubbed his nose; shadows moved convincingly across his hand. ‘Yes,’ he said. ‘And no. You’ve no doubt heard of us. We don’t report to Port Sol - or to any single nation. We’re a private corporation, but we’re not working for profit. We get some backing from the UN, but also from most of the individual nation-states in the System as well. And a variety of corporations, who—’

Louise studied Virtual-Poole suspiciously. ‘*Who are you?’*

Poole’s face stiffened, and Louise wondered how much restriction had been placed on the Virtual’s free will. *Lethe, I hate sentience technology*, she thought. *Poole doesn’t deserve this.*

Poole said, ‘I’m a representative of a group called Paradoxa. The Paradoxa Collegiate . . .’

‘Paradoxa.’ Mark smiled. He looked relieved. ‘Is that all? Paradoxa is innocuous enough. Isn’t it?’

‘Maybe.’ Virtual-Poole smiled. ‘Not everyone agrees. Paradoxa is well known for the Earth-terraforming initiatives of the past. But not all Paradoxa’s projects are simple balls of dry ice, you see. Some are rather more - ambitious. And not everyone thinks that projects with such timescales should be permitted to progress.’

Louise shoved her face forward, seeking understanding in the Virtual’s bland, simulated expression. ‘What timescales? How long-term?’

‘*Infinite,*’ Virtual-Poole said quietly. ‘Paradoxa’s backers are people who wish to invest in the survival of the species itself, Louise.’

There was a long silence.

‘Good grief.’ Milpitas shook her head. ‘I don’t know about you, but I need to sit down. And how about that drink, Poole?’

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5

Lieserl was suspended inside the body of the Sun.

She spread her arms wide and lifted up her face. She was deep within the Sun's convective zone, the broad mantle of turbulent material beneath the glowing photosphere. Convective cells larger than the Earth, tangled with ropes of magnetic flux, filled the world around her with a complex, dynamic, three-dimensional tapestry. She could hear the roar of the great gas founts, smell the stale photons diffusing out towards space from the remote core.

She felt as if she were alone in some huge cavern. Looking up she could see how the photosphere formed a glowing roof over her world perhaps fifty thousand miles above her, and the inner radiative zone was a shining, impenetrable sea another fifty thousand miles beneath her. The radiative zone was a ball of plasma which occupied eighty per cent of the Sun's diameter - with the fusing core itself buried deep within - and the convective zone was a comparatively thin layer above the plasma, with the photosphere a crust at the boundary of space. She could see huge waves crossing the surface of the radiative-zone 'sea': the waves were g-modes - gravity waves, like ocean waves on Earth - with crests thousands of miles across, and periods of days.

Lieserl ? Can you hear me? Are you all right?

She thrust her arms down by her sides and swooped up into the convective-zone 'air'; she looped the loop backwards, letting the floor and roof of this cavern-world wheel around her. She opened up her new senses, so that she could feel the turbulence of the gas, with its almost terrestrial density, as a breeze against her skin, and the warm glow of hard photons diffusing out from the core was no more than a gentle warmth against her face.

Lieserl ?

She suppressed a sigh.

'Yes. Yes, Kevan. I'm perfectly all right.'

Damn it, Lieserl, you're going to have to respond properly. Things are difficult enough without—

'I know. I'm sorry. How are *you* feeling, anyway?'

Me? I'm fine. But that's hardly the point, is it? Now come on, Lieserl, the team here are getting on my back; let's run through the tests.

'You mean I'm not down here to enjoy myself?'

The tests, Lieserl.

'Yeah. Okay, electromagnetic first.' She adjusted her sensorium. 'I'm plunged into darkness,' she said dryly. 'There's very little free radiation at any frequency - perhaps an X-ray glow from the photosphere; it looks a little like a late evening sky. And—'

Come on, Lieserl. We know the systems are functioning. I need to know what you see, what you feel.

'What I feel?'

She spread her arms and sailed backwards through the buffeting air. She *opened* her eyes again.

The huge semistable convection cells around her reached from the photosphere to the base of the convective zone; they buffeted against each other like living things, huge whales in this insubstantial sea of gas. And the honeycomb of activity was driven by the endless flux of energetic photons out of the radiative sea of plasma beneath her.

'I feel wonderful,' she said. 'I see fountains. A cave-full of them.'

Good. Keep talking, Lieserl. You know what we're trying to achieve here; your senses - your Virtual senses - are composites, constructs from a wide variety of inputs. I can see the individual elements are functioning; what I need to know is how well the Virtual sensorium is integrating—

'Fine.' She rolled over onto her belly, so that she was gliding face-down, surveying the plasma sea below her.

Lieserl, what now?

She adjusted her eyes once more. The flux tubes came into prominence, solidifying out of the air; beyond them the convective pattern was a sketchy framework, overlaid. 'I see the magnetic flux,' she reported. 'I can see what I want to see. It's all working the way it's supposed to, I think; I can pick out whatever feature of the world I choose, here.'

'*World*'?

'Yes, Kevan.' She glanced up at the photosphere, the symbolic barrier separating her forever from the Universe of humanity. 'This is my world, now.'

Maybe. Just don't lose yourself down there, Lieserl.

‘I won’t.’

It sounded as if there was some sympathy in his voice - knowing Kevan, there probably was; they had grown almost close in the few days she’d had left after her tour with him around the Sun.

But it was hard to tell. The communication channel linking them was a path through the wormhole, from the Interface fixed among the habitats outside the Sun to the portal which had been dropped into the Sun, and which now sustained her. The comms link was ingenious, and seemed reliable, but it wasn’t too good at relaying complex intonations.

Tell me about the flux tubes.

The tubes were each a hundred yards broad, channels of magnetic energy cutting through the air; they were thousands of miles long, and they filled the air around her, all the way down to the plasma sea.

Lieserl dipped into a tube, into its interior; she felt the tingle of enhanced magnetic strength. She lowered her head and allowed herself to soar along the length of the tube, so that its walls rushed past her, curving gracefully. ‘It’s terrific,’ she said. ‘I’m in an immense tunnel; it’s like a fairground ride. I could follow this path all the way round the Sun.’

Maybe. I don’t know if we need the poetry, Lieserl. What about other tubes? Can you still see them?

‘Yes.’ She turned her head, and induced currents in her Virtual body made her face sparkle with radiation. ‘I can see hundreds, thousands of the tubes, all curving through the air—’

The ‘air’?

‘The convective zone gases. The other tubes are parallel with mine, more or less.’ She sought for a way to convey the sensation. ‘I feel as if I’m sliding around the scalp of some immense giant, Kevan, following the lines of hairs.’

Scholes laughed. *Well, that’s not a bad image. The flux tubes can tangle, or break, but they can’t intersect. Just like hair.*

‘You know, this is almost relaxing . . .’

Good. Again she detected that hint of sympathy - or was it pity? - in Kevan’s voice. *I’m glad you’re feeling - ah - happy in yourself, Lieserl.*

She let the crisp magnetic flux play over her cheeks, sharp, bright, vivid. ‘My new self. Well, it’s an improvement on the old; you have to admit.’

Now the flux tube curved away, consistently, to the right; she was forced to deflect to avoid crashing through the tube's insubstantial walls.

In following the tube she became aware that she was tracing out a spiral path. She let herself relax into the motion, and watched the cave-world beyond the tube wheel around her. The flux tubes neighbouring her own had become twisted into spirals, too, she realized; she was following one strand in a rope of twisted-together flux tubes.

Lieserl, what's happening? We can see your trajectory's altering, fast.

'I'm fine, Kevan. I've got myself into a rope, that's all . . .'

Lieserl, you should get out of there.

She let the tube's path sweep her around. 'Why? This is fun.'

Maybe. But the rope is heading for the photosphere. It isn't a good idea for you to break the surface; we're concerned about the stability of the wormhole—

Lieserl sighed and let herself slow. 'Oh, damn it, Kevan, you're just no fun. I would have enjoyed bursting out through the middle of a sunspot. What a great way to go.'

Lieserl—

She slid out of the flux tube, relishing the sharp scent of the magnetic field as she cut across it. 'All right, Kevan. I'm at your service. What next?'

We're not done with the tests yet, Lieserl. I'm sorry.

'What do you want me to do?'

One more . . .

'Just tell me.'

Run a full self-check, Lieserl. Just for a few minutes . . . Drop the Virtual constructs. She hesitated. 'Why? I thought you said you could tell the systems were functioning to specification, and—'

They are. That's not the point . . . We're still testing how well integrated they are—

'Integrated into my sensorium. Why don't you just say what you're after, Kevan? You want to test how *conscious* this machine called Lieserl is. Right?'

Lieserl, you don't need to make this difficult for me. Scholes sounded defensive. *This is a standard suite of tests for any AI which—*

'All right, damn it.'

She closed her eyes, and with a sudden, impulsive, stab of will, she let her Virtual image of herself - the illusion of a human body around her - crumble.

It was like - what? Like waking from a dream, a soft, comfortable dream of childhood, waking to find herself entombed in a machine, a crude construct of bolts and cords and gears.

But even *that* was an illusion, she thought, a metaphor for herself behind which she was hiding.

She considered herself.

The wormhole Interface was suspended in the body of the Sun. The thin, searing-hot gas of the convective zone poured into its triangular faces, so that the Interface was embedded in a sculpture of inflowing gas, a flower carved dynamically from the Sun's flesh. That material was being pumped through the wormhole to the second Interface in orbit around the Sun; there, convection zone gases emerged, blazing, making the drifting tetrahedron into a second, miniature Sun around which orbited the fragile human habitat called Thoth.

Thus the Interface refrigerated itself, enabling it to survive with its precious, fragile cargo of data stores . . . The stores which sustained the awareness of herself. And the flux of matter through the Interface's planes was controlled, to enable her to move the Interface through the body of the Sun.

She inspected herself, at many levels, simultaneously.

At the *physical* level she studied crisp matrices of data, shifting, coalescing, the patterns of bits which, together, comprised her memories. Then, overlaid on that - visually, if she willed it, like a ghostly superstructure - was her *logical* level, the data storage and access paths which represented the components of her consciousness.

Good . . . Good, Lieserl. You're sending us good data.

She traced paths and linkages through the interleaved and interdependent structures of her own personality. 'It's functioning well. To specification. Even beyond. I—'

We know that. But, Lieserl, how are you feeling? That's what we can't tell.

'You keep asking me that, damn it. I feel—'

Enhanced.

No longer trapped in a single point, in a box of bone a few inches behind eyes made of jelly.

She was supremely *conscious*.

What was her consciousness? It was the ability to be aware of what was happening in her mind, and in the world around her, and in the past.

Even in her old, battered, rapidly ageing body, she had been conscious, of course. She could remember a little of what had happened to her, or in her mind, a few moments earlier.

But now, with her trace-function memory, she could *relive* her experiences, bit by data bit if she wanted to. Her senses went far beyond the human. And as for inner perception - why, she could see herself laid open now in a kind of dynamic blueprint.

By any test, she was more conscious than any other human had ever been - because she had more of the *mechanism* of consciousness. She was the most conscious human who had ever lived.

. . . *If*, she thought uneasily, *I am still human.*

Lieserl ?

‘Yes, Kevan. I can hear you.’

And ?

‘I’m a lot more conscious.’ She laughed. ‘But possibly not much smarter.’

She heard him laugh in reply. It was a ghostly Virtual sound, she thought, transmitted through a defect in spacetime, and - perhaps - across a boundary between species.

Come on, Lieserl We have work to do.

She let her awareness implode, once more, into a Virtual-human form.

Her perception was immediately simplified. To be seeing through apparently human eyes was comforting . . . in a way. And yet, she thought, *restrictive.*

No wonder Paradoxa had been so concerned to imprint her with sympathy for mankind . . . before it had robbed her completely of her humanity.

Perhaps it wouldn’t be much longer before she felt ready to abandon even this thin vestige of humanity.

And then what?

Bathed in Jovian light, Louise, Uvarov, Milpitas and Mark sat in the soft, reclined couches. The Virtual of Michael Poole held a snifter of old brandy; the glass was filled with convincing blue-gold Interface light sparkles, and Virtual-Poole sipped it with every sign of enjoyment - as if it were the first, and last, such glass he would ever enjoy.

As, probably, it was, for this particular autonomous sentient copy, Louise thought.

'To the survival of the species.' Louise raised her own glass and sipped at whisky, a fine peaty Scotch. 'But what's it got to do with me? I don't even have any kids.'

'Paradoxa has a long history,' Virtual-Poole said stiffly. 'You may not be aware of it, but Paradoxa is already a thousand years old. It took its name from an ancient, obscure religious sect in North America that worshipped the mathematics of quantum physics . . .'

The Paradoxa creed, in some ways, Louise thought, embodied the essence of the pre-Poole optimism of humanity. Paradoxa believed that nothing was beyond the capabilities of mankind.

Poole gazed into his drink. 'Paradoxa believes that if something is physically possible, then it's just a question of engineering.' The Virtual's expression was complex - almost tormented, Louise thought. The Virtual went on, 'But it takes *planning* - perhaps on immense timescales.'

Louise felt a vague anger build in her. *Uvarov was right. This isn't Michael Poole. Poole would not have defended the grandiose claims of Paradoxa like this. This is a travesty of programming in conflict with sentience.*

'In the past,' the Virtual went on, 'Paradoxa sponsored many of the ecoengineering projects which have restored much of the biosphere of Earth - the carbon-sequestration domes, and so on.'

Louise knew that was true. The great macroengineering projects of the last millennium, supplemented by the nano-engineering of the atmosphere and lithosphere and the transfer offplanet of most power-generating and industrial concerns, had stabilized and preserved Earth's fragile ecosystem. There was more woodland covering the temperate regions, now, than at any time since the last glaciation, locking in much of the excess carbon dioxide which had plagued previous centuries. And the great decline in species suffered after the industrialization of a couple of thousand years ago had

long since been reversed, thanks to the use of genetic archives and careful reconstruction - from disparate descendants - of lost genotypes.

Earth had been the first planet to be terraformed.

The Virtual said, ‘But Paradoxa’s goals were modified, following the Friends of Wigner incident . . .’

‘If Paradoxa is such a saintly organization,’ Uvarov growled, ‘then why is it such a thing of shadows? Why the secrets?’

Poole said, ‘Paradoxa is a thousand years old, Doctor. *No* human organization of such longevity has ever been fully open. Think of the great established religions, societies like the Templars, the Masons. Groupings like Paradoxa have a way of accreting tradition, and isolation, around themselves with time.’

‘And,’ Uvarov said sharply, ‘no doubt the long career of Paradoxa has a few dark phases . . .’

Poole didn’t reply.

Louise said, ‘You said the goals of Paradoxa were changed by the Friends incident.’

‘Yes. Let me use this Virtual box of tricks to explain.’

The tetrahedron came to life again. It rotated above them, a gaudy trinket miles across.

‘The *Cauchy* Interface,’ the Virtual said. ‘At the time, the largest wormhole mouth constructed - in fact, the largest exercise in exotic-matter engineering.’

The Virtual’s face was gaunt in the shifting Interface light - wistful, Louise thought.

Michael Poole had been rightly celebrated for his achievements, she thought. He had been the Brunel of his day, and more. His wormhole projects had opened up the System much as the great railroads had opened up Great Britain two thousand years earlier.

A wormhole was a flaw in spacetime - a throat, connecting two events in spacetime that would otherwise be separated by light-years, or millennia. Wormholes existed naturally on all scales, most of them around the size of the Planck length - ten to minus forty-three inches, the level at which space itself became granular.

Working in the orbit of Jupiter, Michael Poole and his team had taken natural wormholes and expanded them; Poole had made wormholes big

enough to permit spaceships to pass through.

Wormholes were inherently unstable. Poole had threaded his wormholes with frameworks of *exotic matter* - matter with negative energy density, with pressure greater than rest mass energy. The exotic matter set up repulsive gravity fields able to hold open the wormholes' throats and mouths.

Louise remembered the excitement of those times. Poole Interfaces were towed out of Jovian orbit and set up all over the System. The wormholes enabled the inner System to be traversed in sublight GUTships in a matter of hours rather than months. The Jovian system became a hub for interplanetary commerce. Port Sol - a converted Kuiper object on the rim of the System - was established as the base for the first great interstellar voyages.

Michael Poole had opened up the Solar System in an explosion of accessibility, more dramatic than anything since the days of the great sea-going voyages of exploration on old Earth.

'It was a wonderful time. But you had greater ambitions in mind,' she said. 'Didn't you, Michael?'

The Virtual stared upwards at the display above, expression frozen, evidently unable to speak.

Mark said gently, 'You mean the *Cauchy*, Louise?'

'Yes. Michael Poole used wormhole technology to travel - not just across space - but across *time*.' She pointed up to the tetrahedron in the dome. 'This is just one Interface from Poole's greatest wormhole project: termini three miles across, and the throat itself no less than a mile wide. The wormhole's second Interface was attached to a GUTship - the *Cauchy*.'

The GUTship was launched on a subrelativistic flight beyond the fringe of the Solar System - a circular tour, designed to return at last to Jupiter. The *Cauchy* carried one of Poole's wormhole Interfaces with it. The other was left in orbit around Jupiter.

The flight lasted fifteen centuries - but thanks to time dilation effects, only two subjective centuries had passed for the *Cauchy*'s crew.

The two Interfaces remained linked by the wormhole flaw. Because of the link, when it returned to the Solar System more than a millennium into the future of the System it had left, the *Cauchy*'s Interface was still connected to its twin in orbit around Jupiter - where only two centuries had

passed since the departure of the *Cauchy*, as they had for the *Cauchy*'s crew.

'By passing through the wormhole,' Louise said, 'it was possible to travel back and forth through time. Thus, Poole had used wormhole technology to establish a bridge across fifteen hundred years, *to the future*.'

Mark pulled at his lips. 'We all know what became of this great time bridge. But - I've never understood - *why* did Poole build it?'

The Virtual spoke, his voice tired, dry - so familiar that Louise felt her heart move. Michael Poole said, 'It was an experiment. I was more interested in proving the technology - the concepts - than in the final application. But—'

'Yes, Michael?' Louise prompted.

'I had a vision - a dream perhaps - of establishing great wormhole highways across time, as well as across space. If the technology is possible, why not? What power might be afforded to the human species with the opening up of such information channels?'

'But the future didn't welcome this great dream,' Uvarov said dryly.

'No, it didn't,' Virtual-Poole said.

The floor of the *Hermit Crab's* lifedome turned transparent; space-darkness washed across it in a sudden flood that made Milpitas gasp audibly.

Louise stood and looked down. There was space-emptiness beyond her feet; her eyes told her she was suspended above an immense drop, and she had to summon all her will not to stumble, weakly, back to her chair . . .

And then, belatedly, she registered what she was seeing: beneath the lifedome, and extending for hundreds of yards in every direction, was a *floor* of some broken, irregular, bloody material - a floor of (what looked like, but couldn't possibly be) *flesh.*

Louise turned slowly around, trying to make out the geometry of what she was seeing.

The flesh-surface, bathed in sickly Jovian light, curved away from her in all directions; the 'floor' was actually the outer surface of a sphere - as if the *Crab* were embedded in an impossible moon of flesh, perhaps a mile wide. If the *Crab*'s drive section still existed, it was buried somewhere deep inside this immense carcass. The clean metal lines of the GUTship's spine -

which connected lifedome to drive unit - were enveloped in a gaping wound in this floor of flesh.

Apart from this huge wound in the fleshy floor caused by the *Crab* (a wound which pooled with what looked unnervingly like blood) there were a number of pockmarks in which metal glistened - weapons emplacements? - and others . . . *eyes*, huge, dimmed analogues of her own eyeballs.

There was a sense of suffering here, she thought: of pain, on an immense scale - the agony of a wounded god.

She peered more closely at the nearest pockmark, trying to make out the nature of the device embedded there. But the image was little more than a sketch - a suggestion of form, rendered in shining chrome.

Virtual-Poole, with Mark, Uvarov and Milpitas, stood beside her. The Virtual studied the flesh landscape sombrely. 'The wormhole route to the future became a channel for invasion - by the *Qax*, an extraSolar species which had occupied the System by the time the bridge was established. You're seeing here a reconstruction of one of the two Qax warships which came back through the wormhole. These are *Spline* - living creatures, perhaps even sentient - a technology unlike anything we've developed.'

Uvarov pointed to the sketchy surface of the Spline. 'Your reconstruction isn't so impressive.'

Virtual-Poole seemed more composed now, Louise thought - more *Virtual*, less *Poole*. She felt grateful for that. He said, 'We know little about the Spline, save their name and gross form. I - Poole - with the help of the rebel humans from the occupation future, destroyed the invading Spline ships.' He peered down at the *Crab*'s spine, the huge, disrupted epidermis. 'You can see how I - how *he* - rammed one of the warships, spearing it with the *Crab*'s GUTdrive. The warship was disabled - but not destroyed; in fact it was possible to take over some of the warship's higher functions.

'I'm going to show you a reconstruction of the last few minutes of Michael Poole's known existence.'

The sky-blue light around them started to shift, to slide over the equipment desks. Louise looked up. The Interface above the ship was moving gracefully across the sky; one triangular face, three miles wide, opened up—

—and, like some immense mouth, descended towards them.

Serena Milpitas said, ‘Lethe. We’re going through it, aren’t we? We’re going into the future.’

Louise looked at Poole. The Virtual gazed upwards, his eyes hardening with memory, ‘I drove the Spline into the wormhole. The wormhole had to be destroyed - the bridge to the future closed . . . That was my only goal.’

The triangular frame passed around the bulk of the Spline warship now; the lifedome shuddered - delicately, but convincingly. Blue-white flashes erupted all around the perimeter of the lifedome - damage inflicted on the flesh of the Spline, Louise guessed, by grazing collisions with the exotic-matter framework.

Suddenly they were inside the tetrahedral Interface - and the wormhole itself opened up before them. It was a tunnel, above the lifedome, delineated by sheets of autumn-gold light - and leading (impossibly) *beyond* the Interface framework, and arcing to infinity.

Louise wished she could touch Poole. This copy was closer to Michael Poole than any cloned twin; he shared Poole’s memories, his consciousness even. How must it be to relive one’s death like this?

Poole said, ‘The flashes in the wormhole throat represent the decay of heavy particles, produced in turn by the relaxing of shear energy in the curved-spacetime walls of the wormhole, which—’

Uvarov growled, ‘Skip the fairground ride; just tell us what happened. How did Poole destroy the wormhole?’

The Virtual turned his face towards Louise, his strong, aged features outlined by shuddering wormhole light. ‘The Spline ships had a hyperdrive, of unknown nature. I opened up my captive hyperdrive *here*—’

The Virtual raised his hands.

The floor bucked beneath them. The wormhole was flooded with sheets of blue-white light which raced towards them and down past the lifedome, giving Louise the sudden impression of huge, uncontrolled speed.

Poole shouted, ‘However the hyperdrive works, it must be based on manipulating the multidimensionality of space. And if so - and if it were operated inside a wormhole, where spacetime is already distorted . . .’

Now the sheets of light gathered into threads, sinuous snakes of luminosity which curved around the GUTship, sundering the spacetime walls.

Mark said, ‘So the hyperdrive made the wormhole collapse?’

‘Perhaps. Or—’ Virtual-Poole lifted his simulated head to the storm of wormhole light.

The threads of light seemed to sink into the fabric of the wormhole itself. Defects - cracks and sheets - opened up in the wormhole walls, revealing a plethora of wormhole tunnels, a hydra-like explosion of ballooning wormholes.

The *Hermit Crab*, uncontrolled, plunged down one wormhole after another into the future.

The *Crab*, at last, came to Virtual rest.

The last wormhole mouth closed behind it, the stresses of its distorted spacetime fabric finally yielding in a gush of heavy particles.

The sky beyond the lifedome was dark - almost empty, save for a random scattering of dimmed, reddened stars. There was no sign of life: no large-scale structure, no purposeful motion.

The sudden flood of darkness was startling. Louise, looking up, shivered; she had a feeling of intense age. ‘Michael - you surely expected to die, in the destruction of the wormhole.’

‘Yes . . . but as you can see - *perhaps* - the wormhole didn’t simply collapse.’ He looked confused. ‘I’m a simulacrum, Louise; I don’t share these memories with Poole . . . But there is evidence. Some of the particles which emerged from the collapsing Interface, in our own time, were of much too high energies to have been generated in the collapse of a single wormhole.

‘We think the impact actually *created* - or at any rate widened - more, branching wormholes, which carried the *Crab* further into the future. Perhaps much further.

‘We have simulations which show how this could happen, given the right form of hyperdrive physics - particularly if there were other cross-time wormholes already extant in the Solar System of the occupation era - perhaps set up by the Qax. In fact, the assumption that the branching *did* occur is allowing us to rule out classes of hyperdrive theory . . .’

The Virtual stood, and paced slowly across the transparent floor. ‘I was determined to close off the time bridge - to remove the threat of invasions from the future. But - I have to tell you - Paradoxa thinks this was a mistake.’ The Virtual twisted his hands together. ‘After all, we had already beaten off one Spline incursion. After Poole’s departure the study of the

Qax incident became the prime focus of Paradoxa. But because the wormhole is closed, Paradoxa is reduced to *inferring* the truth about the future of our species from fragments, from indirect shards of evidence . . .'

Louise said, 'You don't believe it was a mistake, Michael.'

Poole looked haunted; again, Louise realized with an inner ache, his personality was conflicting with the programming imposed on it by Paradoxa.

Mark peered up at the dying stars. 'So. Did Poole survive?'

Louise said, 'I'd like to think he did. Even just for a short while, so that he could understand what he saw.'

Milpitas lay back in her couch and stared up at the scattering of dim, reddened stars. 'I'm no cosmologist . . . but those stars look so *old*. How far in time did he come?'

The Virtual did not reply.

Uvarov said, 'Why have you shown us all this? What do you want?'

Virtual-Poole raised his thin arms to the desolate sky. 'Look around you, Uvarov. Perhaps this is the end of time; it is certainly the end of the stars, of baryonic life. Perhaps there are other life forms out there, not perceived by us - creatures of dark matter, the non-baryonic stuff which makes up nine-tenths of the Universe. But - *where is man?* In fact there's no evidence of life at all here, human or otherwise.

'Paradoxa has pieced together some fragments of the history of the future, from the rubble the *Crab* left behind. We know about the Xeelee, for example. We even know - we think - the name of the Xeelee's greatest project: the *Ring*. But - *what happens to us?* What happens to the human species? What destroys us, even as it extinguishes the stars?

'And - Paradoxa asks - is there anything we can do to avert this, the final catastrophe?'

Louise looked up at the dying stars. 'Ah. I think I understand why I'm here. Paradoxa wants me to follow the *Hermit Crab*. To take the *Great Northern* - not to Tau Ceti - but on a circular trip, like Poole's *Cauchy*, to establish a time bridge. Paradoxa wants to set up a way - a stable way - of reaching *this* era: the end of time.

'I get it. We've long since taken responsibility for the management of our planets - for the survival of their ecologies. Why, now, should we not

take responsibility for our own long term survival as a species?' She felt like laughing. 'Paradoxa really does think big, doesn't it?'

Milpitas sat on the edge of her couch. 'But what does *survival* mean, on such timescales? Surely even with AS treatments, survival of individuals - of us - into the indefinite future is impossible. What, then? Survival of the genotype? Or of the culture of our species - the memes, the cultural elements, perhaps, preserved in some form—'

Uvarov looked fascinated now, Louise thought; all his impatience and irritability gone, he stared up at the Virtual rendition of the future hungrily. 'Either, or both, perhaps. Speaking as a flesh-and-blood human, I share a natural human bias to the survival of the actual genotype in some form. The preservation of mere information appears a sterile option to me.

'But, whatever survival means, *it doesn't matter*. Look beyond the dome. In this time to which Michael Poole travelled, *nothing* of us has survived, *in any form*. And *that's* the catastrophe Paradoxa is determined - clearly - we must work to avert.'

Louise pulled her lip. 'If this is such a compelling case, why is Paradoxa a small, covert operation? Why shouldn't Paradoxa's goals motivate the primary activity of the race?'

Poole sighed. 'Because the case *isn't* so compelling. Obviously. Louise, as a species we aren't used to thinking on such timescales. Not yet. There is talk of hubris: of comparisons with the Friends of Wigner, who came back through time - evidently - to manipulate history, to avert the Qax occupation.' He looked at Louise wearily. 'There isn't even agreement about what you're seeing here. I've shown you just one scenario, reconstructed from the Interface incident evidence. Maybe, it's argued, we're addressing problems that don't really exist.'

Louise folded her arms. 'And what if that's true?'

Uvarov said, 'But if there's even the smallest chance that this interpretation is correct - then isn't it worth some investment, against the possibility?'

Mark frowned. 'So we use the *Northern* to fly to the future. The flight to Tau Ceti is only supposed to take a century.'

Poole nodded. 'With modern technology, the flight of the *Northern* into the future should last no more than a thousand subjective years—'

Mark laughed. ‘Poole, that’s impossible. No ship could last that long, physically. No closed ecology could survive. A closed society would tear itself apart . . . We don’t even know if AS treatment can keep humans alive over such periods.’

Louise stared up at the simulated stars. *A thousand years?* Mark was right; it was inhumanly long - but she had the feeling *it wasn’t long enough* . . .

Uvarov nodded. ‘But that is clearly why you have been chosen: Louise, the best engineer of the day, *and* with will enough to sustain immense projects. You, Mark Wu, a good social engineer—’

‘There are better ones,’ Mark said.

‘Not married to Louise.’

‘Formerly married.’

Poole turned to Milpitas. ‘The proposal is that you, Serena, will make the *Great Northern* herself viable for its unprecedented thousand-year flight. And you, Dr Uvarov, have a deep understanding of the strengths and limitations of the engineering of the *human* form; you will help Mark Wu keep the people - the species - alive.’

Louise saw Uvarov’s eyes gleam.

‘I’ve no intention of going on this flight,’ Mark said. ‘And besides, the *Northern* already has a ship’s engineer. And a damn doctor, come to that.’

Poole smiled. ‘Not for this mission.’

‘Hold it,’ Louise said. ‘There’s something missing.’ She thought over what she had to say: relativistic math, done in the head, was chancy. But still . . . ‘Poole, a thousand-year trip can’t be long enough.’ She looked up at the decaying stars. ‘I’m no cosmologist. But I see no Main Sequence stars up there at all. I’d guess we’re looking at a sky from far into the future - tens of billions of years, at least.’

Poole shook his head. His Virtual face was difficult to see in the faded starlight. ‘No, Louise. You’re wrong. A thousand-subjective-year trip is quite sufficient.’

‘How can it be?’

‘Because the sky you’re seeing isn’t from tens of billions of years hence. It’s from *five million years* ahead. That’s all - five megayears, *nothing* in cosmological time . . .’

‘But how—’

‘More than time will ruin the stars, Louise. If this reconstruction is anything like accurate, there’s an agency at large - which must be acting *even now* - systematically destroying the stars . . .

‘And, as a consequence, us.’

Uvarov turned his face, expressionless, up to the darkling sky.

Virtual-Poole said, ‘We have reason to believe that even our own Sun is subject to this mysterious assault.’ He stood before Louise. ‘Look, Louise, you know I don’t advocate cosmic engineering - I was the one who opposed the Friends of Wigner, who did my damnedest to close my own bridge to the future. *But this is different*. Even I can sympathize with what Paradoxa is attempting here. *Now* can you see why they want you to follow the *Crab*?’

The light show began to fade from the dome; evidently the display was over.

Poole still stood before Louise, but his definition was fading, his outlines growing blocky in clouds of pixels. She reached out a hand to him, but his face had already grown smooth, empty; long before the final pixels of his image dispersed, she realized, all trace of consciousness had fled.

Lieserl soared through her convective cavern, letting her sensory range expand and contract, almost at random.

She thought about the Sun.

For all its grandeur, the Sun, as a machine, was simple. When she looked down and *opened* her eyes she could see evidence of the fusing core, a glow of neutrino light beneath the radiative plasma ocean. If that core were ever extinguished, then the flood of energetic photons out of the core and into the radiative and convective layers would be staunched. The Sun was in hydrostatic equilibrium - the radiation pressure from the photons balanced the Sun’s tendency to collapse inwards, under gravity. And if the radiation pressure were removed the outer layers would implode, falling freely, within a few hours.

The Sun hadn’t always been as stable as this . . . and it wouldn’t always remain so.

The Sun had formed from a contracting cloud of gas - a *protostar*. At first the soft-edged, amorphous body had shone by the conversion of its gravitational energy alone.

When the central temperature had reached ten million degrees, hydrogen fusion had begun in the core.

The shrinkage had been halted, and stability reached rapidly. The fusion was restricted to an inner core, surrounded by the plasma sea and the convective ‘atmosphere’. The Sun, stable, burning tranquilly, had become a *Main Sequence* star; by the time Lieserl entered the convective zone, the Sun had burned for five billion years.

But the Sun would not remain on the Main Sequence forever.

The mass converted to energy was millions of tons per second. The Sun’s bulk was so huge that this was a tiny fraction; in all its five-billion-year history so far the Sun had burned only five per cent of its hydrogen fuel . . .

But, relentlessly, the fuel in the core would be exhausted. Gradually an ash of helium would accumulate in the core, and the central temperature would drop. The delicate balance between gravity and radiation pressure would be lost, and the core would implode under the weight of the surrounding, cooler layers.

Paradoxically, the implosion would cause the core temperature to *rise* once more - so much so that new fusion processes would become possible - and the star’s overall energy output would rise.

The outer layers would expand enormously, driven out by the new-burning core. The Sun would engulf Mercury, and perhaps more of the inner planets, before reaching a new gravity-pressure equilibrium - as a *red giant*. This hundred-million-year phase would be spectacular, with the Sun’s luminosity increasing by a factor of a thousand.

But this profligate expansion was not sustainable. Complex elements would be burned with increasing desperation in the expanding, clinker-ridden core, until at last all the available fuel was exhausted.

As the core’s temperature suddenly fell, equilibrium would be lost with sudden abandon. The Sun would implode once more, seeking a new stability. Finally, as a *white dwarf*, the Sun would consist of little more than its own dead core, its density a million times higher than before, with further contraction opposed by the pressure of high-speed electrons in its interior.

Slowly, the remnant would cool, at last becoming a *black dwarf*, surrounded - as if by betrayed children - by the charred husks of its planets.

. . . At least, Lieserl thought, that was the theory.

If the laws of physics were allowed to unravel, following their own logic unimpeded, the Sun's red giant stage was still billions of years away . . . not mere *millions* of years, as Paradoxa's evidence suggested was the case.

Lieserl's brief was to find out what was damaging the Sun.

Lieserl. Try to pick up the p-modes; we want to see if that sensory mechanism works . . .

'Absolutely. Helioseismology, here I come,' she said flippantly.

She *opened* her eyes once more.

A new pattern was built up by her processors, a fresh overlay on top of the images of convective cells and tangled flux tubes: gradually, she made out a structure of ghostly-blue walls and spinning planes that propagated through the convective cavern. These were *p-modes:* sound waves, pressure pulses fleeing through the Solar gas from explosive events like the destruction of granules on the surface. The waves were trapped in the convective layer, reflected from the vacuum beyond the photosphere and bent away from the core by the increasing sound speed in the interior. The waves cancelled and reinforced each other until only standing waves survived, modes of vibration which matched the geometry of the convective cavern.

The modes filled the space around her with ghostly, spinning patterns; their character varied as she surveyed the depth of the cavern, with length scales increasing as she looked into the interior. Looking up with her enhanced vision Lieserl could see how patches - thousands of miles wide - of the Sun's surface *oscillated* as the waves struck, with displacements of fifty miles and speeds of half a mile a second.

The Sun *rang*, like a bell.

Good . . . good. This is terrific data, Lieserl.

'I'm glad to oblige,' she said dryly.

All right. Now let's try putting it together. Use the neutrino flux, such as it is, and the helioseismology data, and everything else you've got . . . Let's find out how much we can see.

Lieserl felt a thrill of excitement - subtle, but real - as she began to comply. Now she was moving to the core of her mission, even of her life: to look into the heart of the Sun, as no human had done before.

As the processors worked to integrate the data she called up from her long-term memory a template: the *Standard Model* of the Sun. The processors overlaid the cavern around her with yet another level of complexity, as they populated it with icons, graphics, grid lines and alphanumeric labels, showing her the basic properties of the Standard Model. The Model - refined and revised over millennia - represented humanity's best understanding of how the Sun worked. She looked in towards the core and saw how, according to the Model, the pressure and temperature rose smoothly towards the core; the temperature graph showed as a complex three-dimensional sphere in pink and red, reaching an intensely scarlet fifteen million degrees at the very heart.

Slowly, her processors plotted the reality - as she perceived it now - against the theory; graphs and schematics blossomed over each other like clusters of multicoloured flowers.

After a few minutes, her vision stabilized. She stared around at the complex imagery filling the cavern, zooming in on particular aspects, highlighting differences.

Oh, no, Scholes said. *No. Something's wrong.*

'What?'

The discrepancies, Lieserl. Particularly towards the core. This simply can't be right.

She felt amused. 'You've gone to all the trouble of constructing me, of sending me in here like this, and now that I'm here you're going to disbelieve what I tell you?'

But look at the divergences from the Model, Lieserl. Under a command from Scholes, the actual and predicted temperature gradients were picked out in glowing, radiant pinks. *Look at this.*

'Hmm . . .'

According to the Standard Model, the temperature should have fallen quite rapidly away from the fusion region - down by a full twenty per cent from the central value after a tenth of the Sun's radius. But in fact, the temperature drop was much more shallow . . . falling only a few per cent, Lieserl saw, over more than a *quarter* of the radius.

'That's not so surprising. Is it?' In riposte she superimposed a graphic of her own, a variant of the Standard Model. 'Look at this. Here's a model with a dark matter component - photinos, orbiting the core.' The dark

matter - fast-moving, almost intangible particles kept clustered around the heart of the Sun by its gravity field - transferred energy out of the core and to the surrounding layers. ‘See? The photinos just leak kinetic energy - heat energy - out of the core. The central temperature is suppressed, and the core is made isothermal - uniform temperature - out to about ten per cent of the radius.’

Scholes sounded testy, impatient. *Yes*, he said, *but what we’re looking at here is an isothermal region covering three times that radius - twenty-five times the volume predicted even by the widest of the Standard Model’s variants. It’s impossible, Lieserl. Something must be going wrong with—*

‘With what? With the eyes you’ve built for me? Or with your own expectations?’

Irritated, she cancelled all the schematics. The spheres and contour lines imploded in sparkles of pixels, exposing the native panorama of the convective cavern, a complex, ghostly overlay of flux tubes, p-modes and convection cells.

Frustrated, with some analogue of nervous energy building in her, she sent her Virtual self soaring around the cavern. She chased the rotating p-wave modes, sliced through flux tubes. ‘Kevan. What if the effect we’re seeing is *real* ? Maybe this divergence in the core is what you’ve sent me in here to find.’

Maybe . . . Lieserl, what will you do next?

‘It’s early days, but I think I’ll soon have learned all I can out here.’

Out here?

‘In the cavern - the convective zone. All the evidence we have is indirect, Kevan. The real action is deeper in, at the core.’

But you can’t go any deeper, Lieserl. Your design . . . the wormhole will implode if you try to penetrate the radiative zone . . .

‘Maybe. Well, it’s up to you to sort that out, Kevan.’

She swooped up to the glowing roof of the cavern, and plunged down, at hundreds of miles a second, towards the plasma sea, past the slow-pulsing flanks of giant p-modes.

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6

Like an insect circling an elephant the pod skimmed around the hull of the *Great Northern.*

Mark Wu, Louise Armonk, Garry Uvarov and Serena Milpitas sat and watched as their tiny pod skirted the starship. Their silence, Mark thought, was suitably deep and awe-struck, even for four who had been as close to the final stages of the project as these. And maybe that was Louise's intention today, he thought, the subtext under what was ostensibly a simple inspection tour of the ship by her top management team.

Well, if so, she was certainly succeeding.

The lifedome of the *Northern* was a squat, transparent cylinder a mile wide. It was extraordinary to think that the whole of Michael Poole's GUTship - drive section and all - would have fitted inside that sparkling box; Mark tried to imagine the *Hermit Crab* suspended in that great cylinder like some immense model under glass.

Mark could see dearly the multiple decks of the dome, and throughout the dome there was movement and light, and the deep, refreshing green of growing things. He was aware that the adaptation of much of the dome, and the rest of the ship, was still unfinished; most of what he saw was little more than a Virtual projection. But still he was impressed by the scale and vigour of it all. This lifedome would be a self-contained city - no, more than that: a world in itself, a biosphere suspended between the stars.

Home to five thousand people for a thousand years.

Now they wheeled to the underside of the lifedome. The pod approached the immense, tangled structure of the *Northern*'s main spine, and flew parallel to the spine for some three hundred yards towards the base of the dome.

The spine was a three-mile highway of metal littered with supply modules and antennae and other sensors, turned up to the distant stars like mouths. Behind them the spine led to the mysterious darkness of the drive section, where the lights of workers - human and robotic - crawled like flies. And, attached to the spine by bands of gold just before the drive section, was the huge Interface, the wormhole terminus which they would tow to the future. The tetrahedral frame looked like a gaudy, glittering toy of shining blue ribbon.

Uvarov spread his long, intelligent fingers and rested his hands against the gleaming hull of the pod. ‘Lethe,’ he said. The pod’s lights struck highlights from his bony profile as he peered out at the spine. ‘It might not be real, but it’s beautiful.’

Louise laughed; beside the thin, gaunt eugenicist she looked short, compact, Mark thought. ‘Real enough,’ she said. ‘The spine’s framework is a hundred per cent realized. It’s just the superstructure that remains nebulous.’ She thought for a moment, then called, ‘Configure 3-B.’

The flower-like antennae clustered along the spine melted away, dissolving into showers of pixel cubes which tumbled like snowflakes. For a few surreal seconds Virtual configurations of equipment modules blossomed over the spine; through the snowstorm of modules Mark could see the basic - and elegant - structure of triangular vertebrae at the core of the spine.

At last the storm of images stilled; the spine settled into a new scattering of lenses and antennae. To Mark’s untutored eye this looked much the same as the original - perhaps rather sparser - but he became aware that Serena Milpitas was nodding, almost wistfully.

‘This is the original configuration,’ she said. ‘It’s what was planned when the ship was being designed for its one-way hop to Tau Ceti, just a century away.’

Mark studied Milpitas curiously. The project’s new chief engineer affected physical-forty, but Mark knew she was at least twice as old as that. He also knew there had been quite a bit of friction between Milpitas and Louise; so he was surprised to find, now, Milpitas praising Louise’s design. ‘You sound a little - nostalgic. Do you really think this is a better design?’

‘Oh, yes.’ Milpitas’ broad face split in a smile; she seemed surprised by the question. ‘Don’t you? Can’t you see it?’

Uvarov grunted. ‘Not particularly.’

‘Inelegance was forced on us. Look - for a thousand-year flight the problems of reliability are enormous.’ Her accent was broad, confident Martian. ‘This ship has around a thousand million distinguishable components. And all of them have to work perfectly, all of the time. Right? Now, we estimate that the chance of a significant failure of any one of those components - of a failure serious enough to knock out a ship’s system, say - is a tenth of one per cent per year. Pretty good odds, you might think. But as

the years go by the chances of a failure mount up, and they work cumulatively.' She fixed Mark with a direct stare. 'What would you guess the chances of such a failure would be after a hundred years?'

Uvarov growled, 'Oh, please, spare us games.'

Mark shrugged. 'A few per cent?'

'Not bad. Ten per cent. Not wonderful, but liveable with.'

Uvarov clicked his tongue. 'I hate your Mons Olympus grammar, engineer.'

Milpitas ignored him. 'But after a *thousand* years, you're looking at a failure probability of over *sixty* per cent. You reach fifty-fifty after just seven centuries—'

'What she's trying to tell you,' Uvarov said heavily, his flat Lunar tones conveying his boredom, 'is the obvious fact that they've had to perform extensive redesign to enable the ship to survive a thousand-year flight.'

'How? Louise doesn't tell me a damn thing.'

Uvarov grinned. 'Ex-wives never do. I should know. I—'

Milpitas cut in, 'With current technology, we couldn't get the reliability rates high enough for the mechanical, electrical or semisentient components.' She waved a hand at the half-Virtual panorama beyond the hull. 'Amazing, isn't it? We think we've come so far. We thought that with nanobotic technology - continual repair and replacement at the sub-visible level - reliability problems were a thing of the past. I mean, look at that spine out there. There's sentience in it *everywhere*, right down to the nuts and bolts.'

'There are *no* nuts and bolts, Serena,' Louise said dryly.

Milpitas ignored her. 'And yet it doesn't take much of a challenge to move us beyond the envelope of our capabilities. Strictly speaking, a thousand-year flight is still beyond our means.'

'That sounds ominous,' Mark said uneasily.

'So,' Louise said, 'we had to look to the past - simple methods used to improve reliability on projects like the first off-Earth flights.' She called out, 'Central configuration,' and the blizzard of virtual components swirled once more around the spine, settling at last into the pattern Mark remembered from before Louise's change.

Milpitas pointed. 'And this is what we're going to the stars with. Look at it. Even at this gross macroscopic level you can *see* there are many more

components. ’ And, indeed, Mark realized now that there were more antennae, more sensor snouts, more maintenance pods; the spine structure looked busier, far more cluttered.

‘Triple redundancy,’ Milpitas said with a grimace. ‘Words - and a technique - from the twenty-fifth century. Or further back, even, for all I know; probably from the time of those disgusting old fission reactors. Carrying three of everything - or more, for the key components - to reduce the chance of a catastrophe to the invisibly small.’

‘Gripping,’ Uvarov said. ‘But shall we move on, some time today? We do have the whole of the ship to inspect, as I recall.’

The base of the lifedome expanded in Mark’s vision until it covered the sky, becoming an immense, complex, semitransparent roof; guide lights and the outlines of ports - large and small - encrusted the surface with colour, and everywhere there was movement, a constant flow of cargo, pods and spacesuited figures through the multiple locks. Again Mark had the impression that this was not so much a ship as a city: immense, busy, occupied with the endless business of maintaining its own fabric.

Suspended beneath the lifedome, cradled in cables, was the dark, wildly incongruous form of the *Great Britain*. It looked like an immense lifeboat, suspended there, Mark thought; he grinned, relishing this evidence of Louise’s sentimentality.

The pod, working autonomously, made a flawless entry into one of the huge airlocks. After a couple of minutes the lock had completed its cycle.

The four of them emerged, drifting, into the air at the base of the *Northern*’s lifedome. It seemed to Mark that the base itself - constructed with the universal semisentient transparent plastic - was a wall dividing the Universe into two halves. Before him was the elaborate, sparkling-clean interior of the lifedome; behind him was the tough, angular spine of the GUTship, and the static darkness of transPlutonian space.

Louise led them to a row of zero-gee scooters; the scooters nuzzled against the transparent base, neat and efficient. Mark took a scooter. It was a simple platform, its pneumatic jets controlled by twists of its raised handles.

They formed into pairs - Louise and Uvarov in the lead, with Mark and Milpitas following. With near-silent sighs of scooter air the four moved off in formation, up towards the heart of the lifedome.

The lower fifth of a mile of the lifedome was known as the loading bay: a single, echoing hall, brilliantly lit and free of partitions. The roof of the loading bay - the underside of the first habitable section, called the maintenance bulkhead - was a mist-shrouded tangle of infrastructure, far above. Today, the loading bay was filled with bulky machinery and crates of supplies; huge masses, towed by people on scooters or by ‘bots, crossed the air in all directions, emerging from a dozen locks.

Serena Milpitas performed a slow, easy spiral as she rose up through the air beside Mark. ‘I love these scooter things, don’t you?’

Mark smiled. ‘Sure. But they’re a lazy way to travel in zero gee. And they won’t be a lot of use when we’re underway.’

‘No. A constant one-gee drive for a thousand years. What a drag.’

Mark studied the engineer as she went through her rolls; her expression was calm, almost vacuous, with every sign that she was lost in the simple physical pleasure of the scooter-ride. Mark said, ‘How did you feel about having to dig up those old techniques - the reliability procedures?’

‘How did I *feel*?’ Milpitas stabilized her scooter and studied Mark, a half-smile on her face. ‘You sound like a Keplerian . . . They’re dippier than anyone else back home on Mars. Ah, but I guess that’s your job, isn’t it? The social engineer.’

Mark smiled. ‘Maybe. But I’m off-duty now.’

‘Sure you are.’ Milpitas thought for a moment. ‘I guess our work isn’t so dissimilar, Mark. Your job- as I understand it - is to come up with ways for us to live with each other over a thousand years. Mine is to ensure that the ship itself - the external fabric of the mission - can sustain itself. When it came to redesigning *Northern*, I didn’t like messing up Louise’s nice, clean designs, frankly. But if you’re going to succeed at something like this you have to take no chances. You have to *plan*.’ Her eyes lost their focus, as if she were looking at something far away. ‘It had to be done. And it was worth it. Anything’s worth it, for the project, of course.’ Her expression cleared, and she looked at Mark, appearing confused. ‘Is that answering your question?’

‘I think so.’

Mark hung back a little, and let Milpitas move ahead, up towards the complex maintenance bulkhead. He fell into line with Louise.

‘You don’t look so happy,’ Louise said.

Mark shrugged. ‘Just a little spooked by Serena, I guess.’

Louise snorted. ‘Aren’t we all.’

Many of the original crew of the *Northern* - who had, after all, seen themselves as potential colonists of the Tau Ceti system, not as time travellers with quasi-mystical goals about saving the species - had decided not to stay with the ship after its new flight plan was announced by Louise. Louise had lost, for instance, the genial Sam Gillibrand, her original first assistant. On the other hand, Serena Milpitas - and Uvarov, for that matter - had seemed eager to join the project after its rescoping by Paradoxa.

Both Milpitas and Uvarov seemed natural Paradoxa supporters, to Mark; they’d absorbed with a chilling alacrity the induction programmes Paradoxa had offered them all.

Milpitas and Uvarov had become *converts*, Mark thought uneasily.

‘You know, I always liked Sam Gillibrand,’ he said wistfully. ‘Sam wants to go to Tau Ceti and build houses under the light of a new sun; the dark possibilities of five megayears hence couldn’t be of less interest to him. Serena is different, though. Under all that bluff Martian chatter and confident engineering, there’s something darker - more driven. Obsessive, even.’

‘Maybe,’ Louise said. ‘But, just as human engineering isn’t yet up to thousand-year flights, so the average human head isn’t capable of thinking on thousand-year timescales.’ She sighed and ran her fingers through her close-cropped hair. ‘Serena Milpitas can win through for the mission, Mark. Both Milpitas and Uvarov seem able to think in millennia - megayears, even. And as a consequence, or as a cause, they are dark, multilevelled, complex people.’ She looked at Mark sadly. ‘The Paradoxa stuff is spooky, I agree. But I think it comes with the territory, Mark.’

Maybe in the complexities of the future the home-builders like Sam would be obsolete, their simple skills and motivation displaced in a dangerous Universe, Mark thought. Perhaps Paradoxa and its converts represented the human of the future - the next wave of evolution, what the species would have to become to survive on cosmic timescales.

Maybe. But - judging by Milpitas and Uvarov - there wouldn’t be too many laughs.

Anyway, he thought gloomily, he was going to have *ten centuries* with these people to find out about them . . . And it was going to be Lethe’s own

challenge for him to construct a viable society around them.

‘It still surprises me that *you* agreed to sign up for this,’ he said. ‘I mean, they took away your mission.’

Louise shrugged. ‘We’ve been over this enough times. Let’s face it, they would have taken *Northern* away from me anyway. I want to see the ship perform. And—’

‘Yes?’

She grinned. ‘Besides, after I got over my irritation at the way Paradoxa runs its affairs, I realized no one’s ever tried a thousand-year flight before. Or tried to establish a time bridge across five million years. I can get one over on Michael Poole, wherever he is—’

‘Yes, but look what happened to him.’

Mark could see what was going on inside Louise’s head. With the Paradoxa mission - with this immense *stunt* - she was going to be able to bypass the intimidating shadow of the future, simply by leaping over it. And she was obviously entranced by the idea of taking her technology to its limits. But he wondered if she really - *really* - had any idea of the scale of the problems they would face.

He opened his mouth to speak

Louise, with unusual tenderness, laid a finger over his lips, closing them. ‘Come on, Mark. We’ve a thousand years to think of all the problems. Time enough. Today, the ship is bright and new; today, it’s enough for me to believe the mission is going to be *fun*.’

With a sudden access of vigour she twisted the handle of her scooter and hurried after the others.

Lieserl. Take it easy. You’re doing fine.

She looked up, tipping back her head. Already she was dropping out of the complex, exhilarating world of the convection region, with its immense turbulent cells, tangled flux tubes and booming p-waves. She stared upwards, allowing herself the luxury of nostalgia. The convective-zone cavern had come to seem almost homely, she realized.

Homely . . . at least compared to the regions she was going to enter now.

We’re still getting good telemetry, Lieserl.

‘Good. I’m relieved.’

Lieserl, how are you feeling?

She laughed. With a mixture of exasperation and affection, she said, ‘I’ll feel better when you lose your “good telemetry”, Kevan, and I don’t have to listen to your dumb-ass questions any more.’

You’ll miss me when I’m gone.

‘Actually,’ Lieserl said, ‘that’s probably true. But I’m damned if I’m going to tell you so.’

Scholes laughed, his synthesized voice surprisingly realistic. *You haven’t answered my question.*

Her arms still outstretched, she looked down at her bare feet. ‘Actually, I feel a little like Christ. Dali’s Christ, perhaps, suspended in the air over an uncaring landscape.’

Yeah, Scholes said casually. *My thought exactly.*

Now she plunged through the last ghost-forms of convective cells. It was exactly like falling out of a cloud bank. The milky-white surface of the plasma sea was exposed beneath her; huge g-mode waves crawled across its surface, like thoughts traversing some huge mind.

Her rate of fall suddenly increased. It felt as if the bottom had dropped out of her stomach.

‘Lethe,’ she whispered.

Lieserl ?

She found her chest tightening - and that was absurd, of course, because she *had* no chest. She struggled to speak. ‘I’m okay, Kevan. It’s just a little vertigo.’

Vertigo?

‘Virtual vertigo. I feel like I’m falling. This illusion’s too damn good.’

Well, you are falling, Lieserl. Your speed’s increased, now you’re out of the convective stuff.

‘I’m *scared*, Kevan.’

Take it easy. The telemetry is—

‘Screw the telemetry. Just talk to me.’

He hesitated. *You’re a hundred thousand miles beneath the photosphere. You’re close to the boundary of the radiative zone; the centre of the Sun is another seven hundred thousand miles below you.*

‘Don’t look down,’ she breathed.

Right. Don’t look down. Listen, you can be proud; that’s deeper than any probe we’ve dropped before.

Despite her fear, she couldn't let that go. 'So I'm a probe, now?'

Sorry. We're looking at the new material squirting through the other end of your refrigerator-wormhole now. I can barely see the Interface for the science platforms clustered around it. It's a great sight, Lieserl; we've universities from all over the System queuing up for observation time. The density of the gas around you is only about one per cent of water's. But it's at a temperature of half a million degrees.

'Strong stuff.'

Angel tears, Lieserl . . .

The plasma sea was rushing up towards her, bland, devouring. Suddenly she was convinced that she, and her flimsy wormhole, were going to disappear into that well of fire with barely a spark. 'Oh, Lethe!' She tucked her knees up to her chest and wrapped her arms around her lower legs, so that she was falling curled up in a foetal ball.

Lieserl, you're not committed to this. If you want to pull out of there—

'No.' She closed her eyes and rested her forehead against her knees. 'No, it's all right. I'm sorry. I'm just not as tough as I think I am, sometimes.'

The wormhole is holding together. We think, after the redesign we've done, that you can penetrate at least the first few thousand miles of the radiative zone, without compromising the integrity of the wormhole. Maybe deeper; the temperature and pressure gradients are pretty small. But you know we didn't advise this dive—

'I know it.' She opened her eyes and faced the looming sea once more. The fear was still huge, like a vice around her thinking. 'Kevan, I'd never assemble the courage to go through this a second time. It's now or never. I'll even try to enjoy the ride.'

Stay with it, Lieserl.

'Yeah,' she growled. 'And you stay with me—'

Suddenly her fall was halted. It felt as if she had run into a wall of glass; her limbs spread-eagled against an invisible barrier and the breath was knocked out of her illusory lungs. Helpless, she was even thrown back up into the 'air' a short distance; then her fall resumed, even more precipitately than before.

She screamed: '*Kevan*!'

We saw it, Lieserl. I'm still here; it's okay. Everything's nominal.

Nominal, she thought sourly. *How comforting*. ‘What in Lethe was *that?’*

You’re at the bottom of the convective layer. You should have been expecting something like that.

‘Yes?’ she snarled. ‘Well, maybe you should have damn well told me - yike!’

Again, that sudden, jarring arrest, followed by a disconcerting hurl into the air, as if she were an autumn leaf in the breeze. *Like snakes and bloody ladders*, she thought.

You’re passing through the boundary layer between the radiative and convective zones, is all, Scholes said with studied calm. *Below you is plasma; above you atomic gas - matter cool enough for electrons to stick to nuclei.*

The photons emerging from the fusing core just bounce off the plasma, but they dump all their energy into the atomic gas. It’s the process that powers the convective zone, Lieserl. A process that drives convective founts bigger than worlds. So you shouldn’t be surprised if you encounter a little turbulence. In fact, out here we’re all interested by the fact that the boundary layer seems to be so thin . . .

We’re still tracking you, Lieserl; you shouldn’t be afraid. You’re through the turbulence now, aren’t you? You should be falling freely again.

‘Yes. Yes, I am. So I’m in the sea, now?’

The sea?

‘The plasma sea. The radiative zone.’

Yes.

‘But—’

Suddenly, almost without warning, the familiar skyscape of convection cells and flux tubes was misting from her sight, whiting out. There was whiteness above, before, below her; it was like being suspended inside some huge, chilling eggshell.

But what? What is it, Lieserl ? What’s wrong?

For the first time she felt real panic creep around her mind.

‘I can’t *see*, Kevan.’

Mark, rising through brightly lit air, looked down. He was nearing the top of the loading bay now. The base was a floor of glass far below him,

with the spine and drive section ghostly forms beyond; people and ‘bots criss-crossed the bay, hauling their cargo.

Mark tried to analyse his own impressions as they rose. For a moment he fought an irrational surge of vertigo: a feeling - despite the evidence of his eyes that he was in zero-gee - that if he tumbled from this scooter he would plummet to that floor of glass, far below. He concentrated on the environment close to him, the thick layer of warm, bright air all round him. But that made the glimpses of the spine and drive - the brutal limbs of the ship - seem unreal, as if the emptiness of space beyond the fragile walls of the dome was an illusion.

Mark felt uneasy. The ship was so huge, so complex - so *convincing*. After a few decades, it would be terribly easy to believe that this ship was a world, to forget that there was anything real, or significant, beyond its walls.

Now they were approaching the roof of the bay: the maintenance bulkhead. Mark drew level with Garry Uvarov, and they stared up at the mile-wide layer of engineering above them. The bulkhead was a tangle of pipes, ducts and cables, an inverted industrial landscape. There were even tree-roots, Mark saw. People and ‘bots swarmed everywhere, working rapidly and apparently efficiently; even as Mark watched, the bulkhead’s complex surface seemed to evolve, the ducts and tubes creeping across the surface like living things. It was a little like watching life spread through some forest of metal and plastic.

‘Extraordinary how primitive it all is,’ Mark said to Uvarov. ‘Cables and ducts - it’s like some sculpture from a museum of industrial archaeology.’

Uvarov waved a cultured hand towards the pipes above him. ‘We’re carrying human beings - barely-evolved, untidy sacks of water and wind - to the stars. We are cavemen inside a starship. That’s why the undersurface of this bulkhead seems so crude to you, Mark; it’s simply a reflection of the crudity of our own human design. We sail the stars. We even have nanobots to rebuild us when we grow old. But we remain primitives; and when we travel, we need immense boxes with pipes and ducts to carry our breath, piss and shit.’ He grinned. ‘Mark, my passion - my career - is the improvement of the basic human stock. Do you imagine the *Xeelee* carry all this garbage around with them?’

They passed through access ports in the maintenance bulkhead and ascended into the habitable sections.

There were fifteen habitable Decks in the mile-deep lifedome, each around a hundred yards apart. Some of the main levels were subdivided, so that the interior of the lifedome was a complex warren of chambers of all sizes. Elevator shafts and walkways pierced the Decks. The shafts were already in use as zero-gee access channels; they'd be left uncompleted, without machinery, until closer to departure.

Now the little party entered one shaft and began to rise, slowly, past the cut-through Decks.

Many of the chambers were still unfinished, and a succession of Virtual designs were being tried out in some of them; Mark peered out at a storm of parks, libraries, domestic dwellings, theatres, workshops, blizzarding through the chambers.

Uvarov said, 'How charming. How Earthlike. More concessions to the primitive in us, of course.'

Mark frowned. 'Primitive or not, Uvarov, we have to take *some* account of human needs when designing an environment like this. As you should know. The chambers have been laid out on a human scale; it's important people shouldn't feel dwarfed to insignificance by the scale of the artifacts around them - or, on the other hand, cramped and confined by ship walls. Why, some of the chambers are so large it would be possible for an inhabitant to forget he or she was inside a ship at all.'

Uvarov grunted. 'Really. But isn't that more evidence that we as a species aren't really yet up to a flight like this? It would be so easy to be immersed in the sensory impressions of the here-and-now, which are so much more *real* than the fragility of the ship, the emptiness outside the thin walls. It would be tempting to accept this ship as a world in itself, an invulnerable background against which we can play out our own tiny, complex human dramas, much as our distant forefathers did on the plains of Africa, billions of miles away.

'Think of the pipes and ducts under that maintenance bulkhead. Perhaps our ancestors, in simpler times, imagined that some such infrastructure lay underneath the flat Earth. The Universe was a box, with the Earth as its floor. The sky was a cow whose feet rested on the four corners of the Earth - or perhaps a woman, supporting herself on elbows and knees - or a vaulted

metal lid. Around the walls of the box-world flowed a river on which the sun and moon gods sailed each day, entering and vanishing through stage doors. The fixed stars were lamps, suspended from the vault. And, presumably, underneath it all lay some labyrinth of tunnels and ducts through which the waters and the gods could travel to begin their daily journeys afresh. The heavens could change, but they were predictable; to the human consciousness - still half-asleep - this was a safe, contained, cosy, womb-like Universe. Mark Wu, is our *Northern*, today, so unlike the Earth as envisaged by let us say - a Babylonian, or an Egyptian?'

Mark rubbed his chin. Uvarov's patronizing style irritated him, but his remarks plugged in closely to his own vague sense of disquiet. 'Maybe not,' he replied sharply. 'But then you and I, and the others, have a responsibility to ensure that the inhabitants of the ship don't slip back into some pre-rational state. That they don't *forget*.'

'Ah, but will that be so easy, over a *thousand years*?'

Mark peered out at the half-built libraries and parks uneasily.

Uvarov said, 'I've heard about some of the programmes you and your social engineering teams are devising. Research initiatives and so forth - make-works, obviously.'

'Not at all.' Mark found himself bridling again. 'I'm not going to deny we need to find something for people to *do*. As you keep saying, we're primitives; we aren't capable of sitting around in comfort for a thousand years as the journey unravels.

'Some of the work is obvious, like the maintenance and enhancement of the ship. But there will be programmes of research. Remember, we'll be cut off from the rest of the human Universe for most of the journey. Some of your own projects come into this category, Uvarov - like your AS enhancement programme.' He thought about that, then said provocatively, 'Perhaps you could come up with some way of replicating Milpitas' triple-redundancy ideas within our own bodies.'

Uvarov laughed, unperturbed. 'Perhaps. But I would hope to work in a rather more *imaginative* way than that, Mark Wu. After all AS treatment represents an enormous advance in our evolutionary history - one of our most significant steps away from the tyranny of the gene, which has ruthlessly cut us down since the dawn of our history. But must we rely on

injections of nanobots to achieve this end? How much better it would be if we could change the fundamental basis of our existence as a species . . .'

Mark found Uvarov chilling. His cold, analytical view of humanity, coupled with the extraordinarily long-term perspective of his thinking, was deeply disturbing. The Paradoxa conversion seemed only to have reinforced these trends in Uvarov's personality.

And, Lethe, Uvarov was supposed to be a *doctor.*

'We should not be restrained by the primitive in us, Mark Wu,' Uvarov was saying. 'We should think of the *possible*. And then determine what must be done to attain that . . . Whatever the cost.

'Your proposals for the social structure in this ship are another example of limited thinking, I fear.'

Mark frowned, his anger building. 'You disapprove of my proposals?'

Uvarov's voice, under its thick layer of Lunar accent, was mocking. 'You have a draft constitution for a unified democratic structure—'

'With deep splits of power, and local accountability. Yes. You have a problem with that? Uvarov, I've based my proposals on the most successful examples of closed societies we have - the early colonies on Mars, for example. We must learn from the past . . .'

Louise was the nominal leader of the expedition. But she wasn't going to be a *captain;* no hierarchical command structure could last a thousand years. And there was no guarantee that AS treatments could sustain any individual over such a period. AS itself wasn't that well established; the oldest living human was only around four centuries old. And who knew what cumulative effect consciousness editing would have, over centuries?

. . . So it could be that none of the crew alive at the launch - even Louise and Mark themselves - would survive to see the end of the trip.

But even if the last person who remembered Sol expired, Louise and her coterie had to find ways to ensure that the mission's purpose was not lost with them.

Mark's job was to design a *society* to populate the ship's closed environment - a society stable enough to persist over ten centuries . . . *and* to maintain the ship's core mission.

Uvarov looked sceptical. 'But a simple democracy?'

Mark was surprised at the depth of his resentment at being patronized like this by Uvarov. 'We have to start somewhere - with a framework the

ship’s inhabitants are going to be able to use, to build on. The constitution will be malleable. It will even be possible, legally, to abandon the constitution altogether—’

‘You’re missing my point,’ Uvarov said silkily. ‘Mark, democracy as a method of human interaction is already millennia old. And we know how easy it is to subvert any democratic process. There are endless examples of people using a democratic system as a games-theory framework of rules to achieve their own ends.

‘Use your imagination. Is there truly nothing better? Have we learned *nothing* about ourselves in all that time?’

‘Democracies don’t go to war with each other, Uvarov,’ Mark said coldly. ‘Democracies - however imperfectly - reflect the will of the many, not the few. Or the *one*.

‘As you’ve told me, Uvarov, we remain primitives. Maybe we’re still too primitive to trust ourselves *not* to operate without a democratic framework.’

Uvarov bowed his elegant, silvered head - but without conviction or agreement, as if merely conceding a debating point.

The four scooters rose smoothly past the half-finished Decks.

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7

She was suspended in a bath of charged particles. It was isotropic, opaque, featureless . . .

She had entered a new realm of matter.

Lieserl. Lieserl ! I know you can hear me; I'm monitoring the feedback loops. Just listen to me. Your senses are overloaded; they are going to take time to adapt to this environment. That's why you're whited out. You're not designed for this, damn it. But your processors will soon be able to interpret the neutrino flux, the temperature and density gradients, even some of the g-mode patterns, and construct a sensorium for you. You'll be able to see again, Lieserl; just wait for the processors to cut in . . .

The voice continued, buzzing in her ear like some insect. It seemed irrelevant, remote. In this mush of plasma, she couldn't even see her own body. She was suspended in isotropy and homogeneity - the same everywhere, and in every direction. It was as if this plasma sea, this radiative zone, were some immense sensory-deprivation bath arranged for her benefit.

But she wasn't afraid. Her fear was gone now, washed away in the pearl-like light. The silence . . .

Damn it, Lieserl, I'm not going to lose you now! Listen to my voice. You've gone in there to find dark matter, not to lose your soul.

Lieserl, lost in whiteness, allowed the still, small voice to whisper into her head.

She dreamed of photinos.

Dark matter was the best candidate for ageing the Sun.

Dark matter comprised all but one hundredth of the mass of the Universe; the visible matter - *baryonic matter* which made up stars, galaxies, people - was a frosting, a thin scattering across a dark sea.

The effects of dark matter had been obvious long before a single particle of the stuff had been detected by human physicists. The Milky Way galaxy itself was embedded in a flattened disc of dark matter, a hundred times the mass of its visible components. The stars of the Milky Way didn't orbit its core, as they would in the absence of the dark matter; instead the galaxy turned as if it were a solid disc - the illuminated disc was like an immense toy, embedded in dark glass.

According to the Standard Model there was a knot of cold, dark matter at the heart of the Sun - perhaps at the heart of every star.

And so, Lieserl dreamed, perhaps it was dark matter, passing through fusing hydrogen like a dream of winter, which was causing the Sun to die.

Now, slowly, the isotropy bleached out of the world. There was a hint of colour - a pinkness, a greater warmth, its source lost in the clouds below her. At first she thought this must be some artifact of her own consciousness - an illusion concocted by her starved senses. The shading was smooth, without feature save for its gradual deepening, from the zenith of her sky to its deepest red at the nadir beneath her feet. But it remained in place around her, objectively real, even as she moved her head. It was *out there,* and it was sufficient to restore structure to the world - to give her a definite *up* and *down.*

She found herself sighing. She almost regretted the return of the external world; she could very quickly have grown accustomed to floating in nothingness.

Lieserl. Can you see that? What do you see?

'I see elephants playing basketball.'

Lieserl—

'I'm seeing the temperature gradient, aren't I?'

Yes. It's nice to have you back, girl.

The soft, cosy glow was the light of the fusion hell of the core, filtered through her babyish Virtual senses.

There was light here, she knew - or at least, there were photons: packets of X-ray energy working their way out from the core of the Sun, where they were created in billions of fusion flashes. If Lieserl could have followed the path of a single photon, she would see it move in a random, zigzag way, bouncing off charged particles as if in some subatomic game. The steps in the random walk traversed at the speed of light - were, on average, less than an inch long.

The temperature gradient in this part of the Sun was tiny. But, it was real, and it was just sufficient to encourage a few of the zigzagging photons to work their way outwards to the surface, rather than inwards. But the paths were long - the average photon needed a thousand billion *billion* steps to reach the outer boundary of the radiative layer. The journey took ten million years - and because the photons moved at the speed of light, the

paths themselves were ten million light-years long, wrapped over on themselves like immense lengths of crumpled ribbon.

Now, as other ‘senses’ cut in, she started to make out more of the environment around her. Pressure and density gradients showed up in shades of blue and green, deepening in intensity towards the centre, closely matching the temperature differentials. It was as if she were suspended inside some huge, three-dimensional diagram of the Sun’s equation of state.

As if on cue, the predictions of the Standard Model of theoretical physics cut in, overlaying the pressure, temperature and density gradients like a mesh around her face. The divergences from the Standard Model were highlighted in glowing strands of wire.

There were still divergences from the Model, she saw. There were divergences *everywhere*. And they were even wider than before.

Dark matter and baryonic matter attracted each other gravitationally. Dark matter particles *could* interact with baryonic matter through other forces: but only feebly, and in conditions of the highest density - such as at the heart of stars. In Earthlike conditions, the worlds of baryonic and dark matter slid through and past each other, all but unaware, like colonies of ghosts from different millennia.

This made dark matter hard to study. But after centuries of research, humans had succeeded in trapping a few of the elusive particles

Dark matter was made up of *sparticles* - ghostly mirror- images of the everyday particles of baryonic matter.

Images in what mirror? Lieserl wondered feebly. As she framed the question the answer assembled itself for her, but - drifting as she was - it was hard to tell if it came from the voice of Kevan Scholes, or from the forced-learning she’d endured as a child, or from the data stores contained within her wormhole.

Hard to tell, and harder to care.

The particle mirror was *supersymmetry*, the grand theory which had at last shown how the diverse forces of physics - gravitational, electromagnetic, strong and weak nuclear - were all aspects of a single, unified superforce. The superforce emerged at extremes of temperature and pressure, shimmering like a blade of some tempered metal in the hearts of supernovas, or during the first instants of the Big Bang itself. Away from

these extremes of time and space, the superforce collapsed into its components, and the supersymmetry was broken.

Supersymmetry predicted that every baryonic particle should have a super-symmetric twin: a sparticle. The electron was paired with a *selectron*, the photon with the *photino* - and so on.

The particular unified-theory variant called *Spin (10)* had, with time, become the standard. Lieserl rolled that around her tongue, a few times. *Spin (10).* A suitably absurd name for the secret of the Universe.

The divergence, of theory from observation, was *immense* - and increased towards the centre of the Sun.

‘Kevan, it’s *way* too hot out here.’

We see it, Lieserl, he said wryly. *For now we’re just logging the data. Just as well you didn’t pack your winter coat.*

She looked within herself, at some of her subsidiary senses. ‘And I’m already picking up some stray photino flux.’

Already? This far out from the centre? Scholes sounded disturbed. *Are you sure?*

As a star like the Sun swept along its path about the centre of the galaxy - through a huge, intangible sea of dark matter - photinos fell into its pinprick gravity well, and clustered around its heart.

The photinos actually *orbited* the centre of the Sun, swarming through its core around the geometric centre like tiny, circling carrion-eaters, subatomic planets with orbital ‘years’ lasting mere minutes. The photinos passed through fusing hydrogen as if it were a light mist . . .

Almost.

The chances of a photino interacting with particles of the plasma were remote - but not zero. Once every orbit, a photino would scatter off a baryonic particle, perhaps a proton. The photino took some energy away from the proton. The gain in energy boosted the orbital speed of the photino, making it circle a little further out from the heart of the Sun.

Working this way, passing through the fusing hydrogen with its coagulated mass of trapped photons, the photinos were extremely efficient at transporting heat out from the centre of the Sun.

According to the Standard Model, the temperature at the centre should have been suppressed by a tenth, and the fusion heat energy smoothed out into the surrounding, cooler regions, making the central regions nearly

isothermal - at a uniform temperature. The core would be a little cooler than it should otherwise have been, and the surrounding material a little warmer.

. . . Just a little. According to the Standard Model.

Now, Lieserl studied the temperature contours around her and realized how far the reality diverged from the ancient, venerated theoretical image. The isothermal region stretched *well* beyond the fusion core - far, far beyond the predictions of the Standard Model with its modest little knot of circling photinos.

‘Kevan, there is *much* more heat being sucked out of the core than the Standard Model predicted. You do realize that there’s no way the Model can be made to fit these observations.’

No. There was a silence, and Lieserl imagined Scholes sighing into his microphone. *I guess this means goodbye to an old friend.*

She allowed the contour forms of the Standard Model to lapse from her sensorium, leaving exposed the gradient curves of the physical properties of the medium around her. Without the spurious detail provided by the overlay of Standard-Model contours, the gradient curves seemed too smooth, deceptively featureless; she felt a remnant of her earlier deprived-sensorium tranquillity return to her. There was no sense of motion, and no real sense of scale; it was like being inside overlaid clouds glowing pink and blue from some hidden neon source.

‘Kevan. Am I still falling?’

You’ve reached your nominal depth now.

‘Nominal. I hate that word.’

Sorry. You’re still falling, but a lot more slowly; we want to be sure we can handle the energy gradients.

But she’d barely breached the surface of the plasma sea; eighty per cent of the Sun’s radius - a full two light-seconds - still lay beneath her.

And you’re picking up some lateral drift, also. There are currents of some kind in there, Lieserl.

It was as if her Virtual senses were dark-adapting; now she could see more structure in the waxy temperature-map around her: pockets of higher temperature, slow, drifting currents. ‘Right. I think I see it. Convection cells?’

Maybe. Or some new phenomenon. Lieserl, you’re picking up data they’ve never seen before, out here. This stuff is only minutes old; it’s a little

early to form hypotheses yet, even for the bright guys in Thoth.

I wish you could see the Interface - out here, at the other end of your heat sink. Deep Solar plasma is just spewing out of it, pumping from every face; it's as if a small nova has gone off, right at the heart of the System. Lieserl, you may not believe this, but you're actually illuminating the photosphere. Why, I'll bet if we looked hard enough we'd find you were casting shadows from prominences.

She smiled.

I can hear you smiling, Lieserl. I'm smart like that. You enjoy being the hero, don't you?

'Maybe just a little.' She let her smile broaden. *I'm casting shadows onto the Sun. Not a bad monument.*

The uppermost level of the *Northern*'s habitable section was a square mile of rain forest.

The four air-scooters rose through a cylindrical Lock. Mark found himself rising up, like some ancient god, into the midst of jungle.

The air was thick, stifling, laden with rich scents and the cries and hoots of birds and animals. He was surrounded by the branchless boles of trees, pillars of hardwood - some extravagantly buttressed - that reached up to a thick canopy of leaves; the boles disappeared into the gloom, rank on rank of them, as if he were inside some nature-born temple of Islam. The floor of the forest, starved of light by the canopy, was surprisingly bare and looked firm underfoot: it was a carpet of leaves, pierced by Lock entrances which offered incongruous glimpses of the cool, huge spaces beneath this sub-world. Fungi proliferated across the floor, spreading filaments through the leaf litter and erecting fruiting bodies in the shape of umbrellas and globes, platforms and spikes hung about by lace skirts.

On a whim, Mark rose through a hundred feet alongside the rotting carcass of a dead tree. The bark was thick with ferns and mosses which had formed a rich compost in the bark's crevices. Huge, gaudy orchids and bromeliads had colonized the bark, drawing their sustenance from leaf mould and collecting moisture from the air with their dangling roots.

He drew alongside a wild banana. Its broad, drooping leaf was marked by a line of holes on either side of the midrib. Mark lifted the leaf, and found suspended from the underside a series of white, fur-coated balls

perhaps, two inches across: nomadic bats, sheltering from the rainfall of this artificial forest.

There was a motion behind him; he turned.

Uvarov had followed him, and was now watching appraisingly. ‘Each day,’ Uvarov intoned, his face long in the gloom, ‘an artificial sun will ride its chariot across the glass sky of this jungle-world. And machines will pipe rainfall into artificial clouds. We’re living in a high-technology realization of our most ancient visions of the Universe. What does the fact that we’ve built this ship in such a way tell us about ourselves, I wonder?’

Mark didn’t answer. He pushed himself away from the tree, and they descended to join the others, just above the forest floor.

Louise slapped the bole of a tree. She grinned. ‘One of the few real objects in the whole damn ship,’ she said. She looked around. ‘This is Deck Zero. I wanted our tour today to end here. I’m proud of this forest. It’s practical - it’s going to be the lungs of the ship, a key part of our ecology - and it has higher purposes too; with this aboard we’ll never be able to forget who we are, and where we came from.’

She looked from one to the other, in the green gloom. ‘We’ve all come into this project from different directions. I’m interested in the technical challenge. And some of you, with Paradoxa sympathies, have rather more ambitious goals to achieve. But we four, above all others, have the responsibility of making this project work. The forest is a symbol for us all. If these trees survive our ten centuries, then surely our human cargo will too.’

Serena Milpitas tilted back her head; Mark followed her example, and found himself peering up at the remote stars through a gap in the canopy. Suddenly he had a shift of perspective - a discontinuity of the imagination which abruptly revealed to him the true nature of this toy jungle, with empty, lightless space above it and a complex warren of humans below.

Garry Uvarov said, ‘But if the Paradoxa projections are correct, who knows what stars will be shining down on these trees in a thousand years?’

Mark reached out and touched a tree bole; he found something comforting about its warm, moist solidity. He heard a shrieking chorus, high above him; in the branches above his head he saw a troupe of birds of paradise - at least a dozen of them - dancing together, their ecstatic golden

plumage shimmering against the transPlutonian darkness beyond the skydome.

A thousand years . . .

Dark matter could age a star.

The photino knot at the heart of the Sun lowered the temperature, and thereby suppressed the rate of fusion reaction. Naively, Lieserl supposed, one might think that this would *extend* the life of the Sun, not diminish it, by slowing the rate at which hydrogen was exhausted.

But it didn't work out like that. Taking heat energy out from the core made the Sun more *unstable*. The delicate balance between gravitational collapse and radiative explosion was upset. The Sun would reach *turnoff* earlier - that is, it would leave the Main Sequence, the family of stable stars, sooner than otherwise.

According to the Standard Model, photinos should reduce the life of the Sun only by a billion years.

Only?

A billion years was a long time - the Universe itself was only around fourteen billion years out of its Big Bang egg - but the Sun would still be left with many billions of years of stable, Main Sequence existence . . .

According to the Standard Model. But she already knew the Model was wrong, didn't she?

Lieserl.

'Hmm?'

We have the answer. We think.

'Tell me.'

The Standard Model predicts the photino cloud should be contained within the fusing core, within ten per cent of the total Solar diameter. Right? But, according to the best fits we've made to your data—

'Go on, Kevan.'

There are actually significant photino densities out to thirty per cent of the diameter. Three times as much as the Model; nearly a third of the—

'Lethe.' She looked down. The heart of the Sun still glowed peacefully in interleaved shades of pink and blue. 'That must mean the fusion core is swamped with photinos.'

Even through the crude wormhole telemetry link she could hear the distress in his voice. *The temperature at the centre is way, way down,*

Lieserl. In fact—

‘In fact,’ she said quietly, ‘it’s possible the fusion processes have already been extinguished altogether. Isn’t it, Kevan? Perhaps the core of the Sun has already gone out, like a smothered flame.’

Yes. Lieserl, the most disturbing thing for me is that no one here can come up with a mechanism for such a photino cloud to form naturally . . .

‘What’s the lifecycle prediction? How long has the Sun left to live?’

No hesitation this time. *Zero.*

At first the blunt word made no sense. ‘What?’

Zero, on the scales we’re talking about - timescales measured in billions of years. In practice, we’re looking at perhaps one to ten million years left. Lieserl, that’s nothing in cosmic terms.

‘I know. But it ties in with the predictions out of Paradoxa, doesn’t it? The data they collected through Michael Poole’s wormhole daisy-chain.’

Yes.

‘Kevan, you shouldn’t feel too distressed. Five million years is fifty times the length of human history so far—’

Maybe. Kevan’s voice took on a harder edge, as if he personally resented the ageing of the Sun. *But I have kids. I hope to have descendants still alive in five million years. Damn it, I hope to be sentient still myself. Why not? It’s only five megayears; we’re out of the Dark Ages now, Lieserl.*

She peered deep into the heart of the Sun, subvocally trying to press more of her functions into play. She had senses to pick up the ghostly shades of neutrino and photino fluxes, and if she just - *tried* - hard enough, she ought to be able to make out the dark matter cloud itself.

‘I’ll have to go deeper,’ she murmured.

What?

‘I said I’m going deeper. I want to find out what’s down there. In the core.’

Lieserl—

‘Come on, Kevan. Spare me any warnings about caution. You can’t tell me that Paradoxa has invested so much in me so far, only to have me turn back just inside the damn photosphere.’

You’ve already achieved an astonishing amount.

‘And I can achieve a lot more. I’m going in, Kevan. Just as I’ve been designed to. I want to see just what has, put out our Sun.’ *Or*, she thought

uneasily, *who.*

Scholes hesitated. *The truth is, you're only an experiment, Lieserl. Damn it, we didn't even know what conditions you would encounter in there.*

'So I'll take my time. You can redesign me en route. I've all the time in the world.

'I'll follow the bouncing photons. Maybe it will take me a million years to drift into the centre. But I'm going to get there.'

Lieserl, Paradoxa wants you to go on. But - you must listen to this - it is prepared to risk you not returning. Your trip could be one way, Lieserl. Do you understand? Lieserl ?

She shut out the whispering, remote voice, and stared into the oceanic depths of the Sun.

PART II
TRAJECTORY: TIMELIKE

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8

His legs locked around a branch of the kapok tree, Arrow Maker raised his bow towards the skydome. The taut bowstring dug into the tough flesh of his three middle fingers, and the bow itself had a feeling of heaviness, of power. The arrow balanced in his grasp, light, perfect.

Maker's bare, hairless skin was slick from the exertion of climbing. He was close to the top of the canopy here, and the clicks, rustles, trills and coughs of the approaching evening sounded from everywhere within the great layer of life around him. Somewhere a group of howler monkeys were calling out their territorial claims, their eerie, almost choral wails rising and falling.

He released the bow string.

The arrow hissed into the air, and the guide line it towed unravelled past Arrow Maker's face with the faintest of breezes.

He heard a clatter in the branches, a few yards away from him, as the arrow returned. But the line didn't fall back; Maker had succeeded in hooking it over an upper branch of the kapok.

He slung his bow across his shoulder, retrieved his quiver, and clambered across the branches, his bare feet easily finding purchase on moss-laden bark. He found the arrow in a mound of moss at the junction of a banyan's trunk with a branch. Working quickly and efficiently, Arrow Maker unravelled a rope from his waist and attached it to the line; the rope - spun by his daughter from liana fibre - was as thick as his finger, and, working by touch, Maker found the rope heavy and difficult to knot.

When the rope was firmly attached Arrow Maker began to haul at the guide line. The rope slithered up through layers of leaves. Soon Maker had pulled the rope over the branch above. He tugged at the rope; there was some give, as the unseen kapok branch flexed, but the hold was more than strong enough to support his weight.

He detached the guide line and wrapped it around his waist. He clipped two metal hand-grips onto the rope. There was a webbing stirrup attached to each grip, and Arrow Maker placed his feet in these. Standing with his weight in one stirrup he moved the other a few feet upwards. Then he raised himself and moved the other grip, up past the first. Thus Arrow Maker climbed smoothly up through the remaining layers of canopy. The grips slid

upwards easily, but ratchets prevented them from slipping down. One of the grips felt a little loose - it was worn, he suspected - but it was secure enough.

As he climbed up through layers of greenery towards the sky, Maker relaxed into the familiar rhythm of the simple exercise, enjoying the glowing feeling in his joints as his muscles worked. The heavy belt around his waist, with its pockets of webbing for his tools and food, bumped softly against his skin; he barely noticed the bow and quiver slung over his shoulder.

The grips, and ropes and stirrups, had belonged to Arrow Maker for at least twenty years. They were among his most treasured possessions: his life depended on them, and they were almost irreplaceable. The people of the forest could make rope, and bows, and face paint, but they simply didn't have the raw materials to manufacture grips and stirrups - or, come to that, knives, spectacles and many other essential day-to-day objects. Even old Uvarov - rolling around the forest floor in his chair - admitted as much.

To get his set of climbing gear, the younger Arrow Maker had traded with the Undermen.

He'd spent many days collecting forest produce: fruit, the flesh of birds, bowls of copaifera sap. He piled his goods in one of the great Locks set in the floor of the forest. He'd communicated his needs to the Undermen by an elaborate series of scratches made with the point of his knife in the scarred surface of the Lock.

When he'd returned to the Lock the next day, there lay the climbing gear he'd wanted, gleaming new and neatly laid out. Of the forest goods there was no sign.

The forest folk relied on Underman artifacts to stay alive. But similarly, Arrow Maker had often thought, perhaps the Undermen needed forest food to survive. Perhaps it was dark down there, beneath the forest, cut off from the light; perhaps the Men couldn't grow their own food. Arrow Maker shivered; he had a sudden vision of a race of nocturnal, huge-eyed creatures skulking like loris through the lifeless, ever-darkened levels below his feet.

He reached the top of his rope. The anchoring branch was only a couple of hand's-breadths thick, but it was solid enough A tree-swift's nest - a ball of bark and feathers, glued by spittle - clung to the side of the branch, sheltering its single egg.

He selected a fatter branch and sat on it, wrapping his legs around its junction with the trunk He placed his bow and quiver carefully beside him, lodging them safely. He drew some dried meat from his belt and chewed at the tough, salty stuff as he gazed around.

Now he'd climbed close to the crown of the kapok tree. The great tree's last few branches were silhouetted against the darkling skydome above him, their clusters of brownish leaves rustling.

The mass of the canopy was perhaps thirty yards below the skydome, but this single giant kapok raised its bulk above the rest, its uppermost branches almost grazing the sky. The darkness of the evening rendered this upper world almost as dark as the forest floor, far below him. But Maker knew his way around the kapok; after all he'd been climbing it for most of his eighty years.

He was at the top of the world. In the distance a bird flapped across the sky, its colours a gaudy splash against the fading light. Beyond the skydome, the stars were coming out. The kapok's branches were a dense, tangled mass beneath him, obscuring its immense trunk. Seeds - fragments of fluffy down - floated everywhere, peppering the leaves with the last of the daylight. Ten yards below the tree's crown, the canopy was a rippling carpet, a dense layer of greenery - turning oily black as night approached - which stretched to the horizon, lapping against the walls of the skydome itself.

Garry Uvarov had sent Arrow Maker up here to inspect the sky. So Maker tipped up his face.

It was tempting to reach up and see if he could touch the sky.

He couldn't, of course - the skydome was still at least twenty feet above him - but it would be easy enough to shoot up an arrow, to watch it clatter against the invisible roof.

The sky was unchanged. The stars were a thin, irregular sprinkling, hardly disturbing the sky's deep emptiness. Most of the stars were dull red points of light, like drops of blood, that were often difficult to see.

Uvarov had never shown interest in the stars before; now, suddenly, he'd ordered Arrow Maker to climb the trees, telling him to expect a sky blazing with stars, white, yellow and blue. Well, he'd been quite wrong.

Maker felt that old Uvarov was important: precious, like a talisman. But, as the years wore by, his words and imperatives seemed increasingly

irrational.

Maker looked for the sky patterns he'd grown to know since his boyhood. There were the three stars, of a uniform brightness, in a neat row; there the familiar circle of stars dominated by a bright, scarlet gleam.

Nothing had changed in the sky above him, in the stars beyond the dome. Arrow Maker didn't even know what Uvarov was expecting him to find.

He clambered down into the bulk of the kapok treetop, so that there was a comforting layer of greenery between himself and the bare sky. Then he tied himself to the trunk with a loop of rope, laid his head against a pillowing arm and waited for sleep.

The klaxon's oscillating wail echoed off the houses, the empty streets, the walls of the sky.

Morrow woke immediately.

For a moment he lay in bed, staring into the sourceless illumination which bathed the ceiling above him.

Waking, at least, was easy. Some mornings the klaxon failed to sound - it was as imperfect and liable to failure as every other bit of equipment in the world - but on those mornings Morrow found his eyes opening on time, just as usual. He pictured his brain as a worn, ancient thing, with grooves of habit ground into its surface. He woke at the same time, every day.

Just as he had for the last five centuries.

Stiffly he swung his legs from his pallet and stood up. He started to think through the shift ahead. Today he was due for an interview with Planner Milpitas - *yet another interview*, he thought - and he felt his heart sink.

He walked to the window and swung his arms back and forth to generate a little circulation in his upper body. From his home here on Deck Two Morrow could make out, through the open, multilayered flooring, some details of Deck Three below; he looked down over houses, factories, offices and - looming above all the other buildings - the imposing shoulders of the Planner Temples, scattered across the split levels like blocky clouds. Beyond the buildings and streets stood the walls of the world: sheets of metal, ribbed for strength. And over it all lay the multilevelled sky, a lid of girders and panels, enclosing and oppressive.

He worked through his morning rituals - washing, shaving his face and scalp, taking some dull, high-fibre food. He dressed in his cleanest standard-issue dungarees. Then he set off for his appointment with Planner Milpitas.

The community occupied two Decks, Two and Three. The inhabited Decks were laid out following a circular geometry, in a pattern of sectors and segments divided from each other by roads tracing out chords and radii. Deck Four, the level beneath Three, was accessible but uninhabited; Paradoxa had long ago decreed that it be used as a source of raw materials. And there was also one level above, called Deck One, which was also uninhabited - but served other purposes.

Morrow had no idea what lay above Deck One, or below Deck Four. The Planners didn't encourage curiosity.

There were few people about as he crossed the Deck. He walked, of course; the world was only a mile across, so walking or cycling almost always sufficed. Morrow lived in Segment 2, an undesirable slice of the Deck close to the outer hull. The Temple was in Sector 3 - almost diametrically opposite, but close to the heart of the Deck. Morrow was able to cut down the radial walkways, past Sector 5, and walk almost directly to the Temple.

Much of Sector 5 was still known as Poole Park - a name which had been attached to it since the ship's launch, Morrow had heard. There was nothing very park-like about it now, though. Morrow, in no hurry to be early for Milpitas, walked slowly past rows of poor, shack-like dwellings and shops. The shops bore the names of their owners and their wares, but also crude, vivid paintings of the goods to be obtained inside. Here and there, between the walls of the shops, weeds and wild flowers struggled to survive. He passed a couple of maintenance 'bots: low-slung trolleys fitted with brushes and scoops, toiling their way down the worn streets.

The rows of small dwellings, the boxy shops and meeting-places, the libraries and factories, looked as they always did: not drab, exactly - each night everything was cleansed by the rain machines - but *uniform.*

Some old spark stirred in Morrow's tired mind. *Uniform. Yes, that was the word. Dreadfully uniform*. Now he was approaching the Planners' Temple. The tetrahedral pyramid was fully fifty yards high, built of gleaming metal and with its edges highlighted in blue. Morrow felt dwarfed

as he approached it, and his steps slowed, involuntarily; in a world in which few buildings were taller than two storeys, the Temples were visible everywhere, huge, faceless - and *intimidating*.

As, no doubt, they were meant to be.

Planner Milpitas turned the bit of metal over and over in his long fingers, eyeing Morrow. His desk was bare, the walls without adornment. ‘You ask too many questions, Morrow.’ The Planner’s bare scalp was stretched paper-thin over his skull and betrayed a faint tracery of scars.

Morrow tried to smile; already, as he entered the interview, he felt immensely tired. ‘I always have.’

The Planner didn’t smile. ‘Yes. You always have. But my problem is that your questions sometimes disturb others.’

Morrow tried to keep himself from trembling. At the surface of his mind there was fear, and a sense of powerlessness - but beneath that there was an anger he knew he must struggle to control. Milpitas could, if he wished, make life very unpleasant for Morrow.

Milpitas held up the artifact. ‘Tell me what this is.’

‘It’s a figure-of-eight ring.’

‘Did you make it?’

Morrow shrugged. ‘I don’t know. Perhaps. It’s a standard design in the shops on Deck Four.’

‘All right.’ Milpitas placed the ring on his desk, with a soft clink. ‘Tell me what else you make. Give me a list.’

Morrow closed his eyes and thought. ‘Parts for some of the machines - the food dispensers, for instance. Not the innards, of course - we leave that to the nanobots - but the major external components. Material for buildings - joists, pipes, cables. Spectacles, cutlery: simple things that the nanobot maintenance crews can’t repair.’

Milpitas nodded. ‘And?’

‘And things like your figure-of-eight ring.’ Morrow struggled, probably failing, to keep a note of frustration out of his voice. ‘And ratchets, and stirrups. Scrapers—’

‘All right. Now, Morrow, the value of a joist, or a pair of spectacles, is obvious. But what do you think of this question: what is the *value* of your figure-of-eight rings, ratchets and stirrups?’

Morrow hesitated. This was exactly the kind of question which had landed him in trouble in the first place. ‘I don’t know,’ he blurted at last. ‘Planner, it drives me crazy not to know. I look at these things and try to work out what they *might* be used for, but—’

The Planner raised his hands. ‘You’re not answering me, Morrow.’

Morrow was confused. He’d long since learned that when dealing with people like Milpitas, words turned into weapons, fine blades whose movements he could barely follow. ‘But you asked me what the ratchets were for.’

‘No. I asked you what you thought of the *question*, not for an answer to the question itself. That’s very different.’

Morrow tried to work that out. ‘I’m sorry. I don’t understand.’

‘No.’ The Planner rested his long, surgery-scarred fingers on the desk before him. Milpitas seemed to be one of those unfortunate individuals suffering a partial AS failure, necessitating this kind of gross rework of his body. ‘No, I really believe you don’t. And that’s precisely the problem, isn’t it, Morrow?’

He stood and walked to the window of his office. From here Morrow could see the outer frame of the Temple; its face was a tilted plane of golden light. Milpitas’ wide, bony face was framed by the iron sky, the sourceless daylight.

‘The question has *no* value,’ Milpitas said at length. ‘And so an answer to it would have no value - it would be meaningless, because the question in itself has no reference to anything meaningful.’ He turned to Morrow and smiled searchingly. ‘I know you’re not happy with that answer. Go ahead; don’t be afraid. Tell me what you think.’

Morrow sighed. *I think you’re crazy*. ‘I think you’re playing with words.’ He picked up the ring. ‘Of *course* this thing has a purpose. It exists, physically. We expend effort in making it—’

‘Everything we do has a purpose, Morrow, and one purpose only.’ Milpitas looked solemn. ‘Do you know what that is?’

Morrow felt vaguely irritated. ‘The survival of the species. I’m not a child, Planner.’

‘Exactly. Good. That’s why we’re here; that’s why Paradoxa built this ship-world of ours; that’s why my grandmother - dead now, of course - and

the others initiated this voyage. That's the purpose that informs everything we do.'

Morrow's irritation turned into a vague rebelliousness. *Everything? Even the elimination of the children?*

He wondered how many interviews, like this, he had suffered over the years. Vaguely he remembered a time when things hadn't been like this. Right at the start of his life, half a millennium ago, the great Virtual devices, hidden somewhere in the fabric of the world, had covered the drab hull walls with scenes of lost, beautiful panoramas: he remembered Virtual suns and moons crossing a Virtual sky, children running in the streets.

There had been a feeling of space - of *infinity*. The Virtuals had had the power to make this box-world seem immense, without constraints.

But Paradoxa had closed down the Virtuals, one by one, exposing the skull-like reality of the world which lay beneath the illusion. No one now seemed to know where the Virtual machines were, or how to get access to them, even if they still worked.

At the same time Paradoxa had first discouraged, then abolished, childbirth. Morrow had been one of the last children to be born, in fact.

Virtual dioramas - and the voices of children - were no longer necessary, Paradoxa said.

There were no young, and the people grew *old*. There was neither day nor night, but only the endless, steel-grey, sourceless light which - diffused from the metal hull - gave the impression of a continual dawn. Leisure activities - theatres, study groups, play groups - had fallen into disuse. The world was structured only by the endless drudgery of work.

Work, and study of the words of the founders of Paradoxa, of course.

Milpitas turned his wide, rather coarse face to Morrow. 'Paradoxa's one imperative is to ensure the survival of the species - physically, through our genes, and culturally, through the memes we carry - into the indefinite future.' He pointed to the iron sky. 'Everything we do is driven by that logic, Morrow. For all we know, we are the only humans alive, anywhere. And so we must optimize the use of our resources.

'At present we're succeeding. Our population is well-adjusted; we have no need of new generations - not until our resource situation changes.'

But, Morrow thought wildly, *but the population isn't stable*. Every year people died - through accident, or obscure AS-failure. So, every year, the

population actually *fell.*

Over the centuries he had witnessed the steady drop in population, the slow retreat from the lower Decks. When Morrow had been born, he was sure that the lifedome had been inhabited all the way down to Deck Eight - and it was said there were another seven or eight Decks below that. Now, only Decks Two and Three were occupied.

Could there be a point, he wondered, below which the race couldn't regenerate itself, even if the temporary sterility was reversed?

What would Paradoxa do then?

Milpitas sat down once more. When he spoke again, the Planner seemed to be trying to be kind. 'Morrow, you must not torment yourself - and those around you - with questions that can't be answered. You know, in principle, *why* our world is as it is. Isn't that sufficient? Is it really necessary for you to understand every detail?'

But if I don't understand, Morrow thought sourly, *then you can control me. Arbitrarily. And* that's *what I find hard to accept.*

Milpitas steepled his fingers. 'Here's another dimension you need to think about. His voice was harsher now. 'Tell me, what are your views on the internal contradictions of the meme versus gene duality?'

Morrow, glowering, refused to answer.

Milpitas smiled, exquisitely patronizing. 'You don't understand the question, do you? Can you read?'

'Yes, I can read,' Morrow said testily. 'I had to teach myself, but, yes, I can read.'

Milpitas frowned. 'But you don't *need* to be able to read. Most people don't need to. It's a luxury, Morrow; an indulgence.

'We must all accept our limitations, Morrow; *you have to accept* that there are people who know better than you do.'

Morrow steeled himself. *Here it comes.* No punishment was going to be terribly onerous, but he found any disruption from his daily routine increasingly difficult, even painful.

'Four weeks on Deck One,' Milpitas said briskly, making a note. 'I'll coordinate this with your supervisor in the shops. I'm sorry to do this, Morrow, but you must see my position; we can't have you disrupting those around you with your - your ill-disciplined thinking.'

Deck One. The Locks. One of the most difficult - if not frightening - places to work on all the Decks. This was a tough punishment, for what he still couldn’t accept as a crime . . .

But, nevertheless, he found himself suppressing a grin at the irony of this. For the Locks - and the strange, illicit trade that went on through them - were an explicit embodiment of the contradictions within his society.

The first tendrils of morning light snaked up over the skydome like living things. The dim stars fled.

Arrow Maker unwrapped himself from his branch and stretched the stiffness out of his limbs. The breeze up here was fresh and dry. He urinated against the bole of the tree; the hot liquid darkened the wood and coursed down towards the canopy. He chewed on some of the meat from his belt, and lapped up dew moisture from the kapok’s leaves. The water wasn’t much, but he’d find more later, in the bowls of orchids and bromeliads.

He retrieved his bow and quiver, made his way to the rope he’d left dangling, and prepared for the first stage of his descent. He passed the rope through a metal figure-of-eight ring, clipped the ring to his belt, and stood up in his webbing stirrups. He slid easily downwards, controlling the run of the rope through the ring with his hand. The figure-of-eight ring, scuffed and worn with use, rang softly as he descended.

The canopy, fifty yards above the forest floor, was a twenty-yard-deep layer of vegetation. Arrow Maker was soon screened from the breeze of the topmost level, and the air grew moist, humid, comfortable.

He found a liana and cut it open; water spurted into his mouth. On his last visit to the canopy, Arrow Maker had spotted a fig-tree which had looked close to fruiting; he decided to take a detour there before returning to Uvarov. He wrapped his rope around his waist, tucked his climbing gear into his belt, and clambered across the canopy, working his way from branch to branch.

Moss and algae coated the bark of the trees and hung from twigs in sheets, making the wood dangerously slippery. Lianas, fig roots and the dangling roots of orchids, bromeliads and ferns festooned the branches like rope. Leaves shone in the gloom, like little green arrow-heads. Some of the flowers, designed to catch the attention of hummingbirds and sunbirds, gleamed red in the gloom; others, pale, fetid, waited patiently for bats to eat their fruit and so propagate their seeds.

Beyond the clutter of life, Maker could see the branchless trunks of the canopy trees. The trunks rose like columns of smoke through the greenery, smooth and massive.

The fig-tree was an incongruous tangle sprouting from the trunk of a canopy tree, a parasite feeding off its host tree. As he approached the fig he knew he'd been right about the fruiting. A parrot hung upside down from a branch, its feathers brilliant crimson, munching at a fig it held in one claw. The rich smell of ripe figs wafted from the leaves, and the branches were alive with animals and birds.

There was even a family of silver-leaf monkeys. Maker got quite close to one female, with a baby clinging to her back. For a few moments Maker watched her working at the fruit; she seemed to sniff each fig individually, as if trying to determine from the perfume if it was ready to consume. At last she found a fig to her liking and crammed it whole into her mouth, while her baby mewled at her neck.

The female suddenly became aware of Arrow Maker. Her small, perfect head swivelled towards him, her eyes round, and for an instant she froze, her gaze locked with Maker's. Then she turned and bounded away through rustling leaves, lost to his sight in a moment.

He worked his way towards the fig, shouting and clapping his hands to scare the scavengers away. He even roused a cluster of fruit bats, unusually feeding during the day; they scattered at his approach, their huge, loose, leathery wings rustling.

At length he reached the bough of the canopy tree, which was wrapped around with fig roots. This was actually a strangler fig, he realized; the crown of the fig was so dense that it was blocking out the light from its host and would eventually take its place in the canopy.

'Arrow Maker.'

His name was whispered, suddenly, close behind him. He turned, startled, and almost lost his grip on the algae-coated branch below him; his bow rattled against his bare back, clumsily.

It was Spinner-of-Rope. Her face was round in the gloom as she grinned at him. Spinner, his older daughter, was fifteen years old, and her short, slim body was as lithe as a monkey's. She bore a full sack at her back. A bright smear of scarlet dye crossed her face, picking out her eyes and nose like a mask; her hair was shaven back from her scalp and dangled in a fringe over

her ears down to her shoulders, rich black. Her metal spectacles shone in the green light.

‘Got you,’ she said.

He tried to recover his dignity. ‘That was irresponsible.’

She snorted and rubbed at her stub of a nose. ‘Oh, sure. I saw you creeping up on that poor silver-leaf. With her baby, too.’ Squatting in the branches, she moved towards him menacingly. ‘Maybe I should climb on your back and see how you like it—’

‘Don’t bother.’ He settled against the bough of the tree, pulled a fig from a branch and bit into it. ‘What’s in the sack?’

‘Figs, and honeycombs, and a few tubers I dug up earlier from the floor . . . I breakfasted on beetle grubs from inside a fallen trunk down there.’ She looked remote for a moment as she remembered her meal. ‘Delicious . . . What are you doing here anyway? I thought you were down with old Uvarov.’

‘I am. In principle. It’s my turn . . .’

The tribe’s fifty people lived out most of their lives in the canopy. So Garry Uvarov had instituted a rota, designating folk who had to spend time with him on the floor below. Uvarov raged if the rota was broken, insisting that even the rota itself was older than any human alive, save himself.

‘Uvarov sent me up top - to the giant kapok - to see if the stars had changed.’

Spinner grunted; she took a fig herself and ate it whole, like a monkey. She wiped her lips on a leaf. ‘Why?’

‘I don’t know . . .’

‘Then he’s an old fool. And so are you.’

Arrow Maker sighed. ‘You shouldn’t say things like that, Spinner. Uvarov is an old man - an ancient man. He remembers when the ship was launched, and—’

‘I know, I know.’ She picked seeds from her teeth with her little finger. ‘But he’s also a crazy old man, and getting crazier.’

Arrow Maker decided not to argue. ‘But whether that’s true or not, we still have to care for him. We can’t let him die. Would you want that?’ He searched her face, seeking signs of understanding. ‘And if you - and your friends - don’t take your turns in the rota—’

‘Which we don’t.’

‘—then it means that people like me have to carry more than our fair share.’

Spinner-of-Rope grinned in triumph, her face paint vivid. ‘So you admit you *resent* having to tend for that old relic down there.’

‘Yes. *No*.’ With a few words she’d made him intensely uncomfortable, as she seemed to manage so often, and so easily. ‘Oh, I don’t know, Spinner. But we can’t let him die.’

She bit into another fig, and said casually, ‘Why not?’

‘Because he’s a human being who deserves dignity, if nothing else,’ he snapped. ‘And—’

‘And what?’

And, he thought, *I’m afraid that if Uvarov is allowed to die, the world will come to an end.*

The world was so obviously *artificial.*

The forest was contained in a box. It was possible to shoot an arrow against the sky. There were holes in the floor, and whole levels - the domain of the Undermen - underneath the world. Hidden machines brought light to the skydome each day, caused the rain to fall over the waiting leaves, and pumped the air around the canopy tops. Perhaps there were more subtle machines too, he speculated sometimes, which sustained the little closed world in other ways.

The world must seem huge to Spinner. But it had become small and fragile in Arrow Maker’s eyes, and as he grew older he became increasingly aware of how dependent all the humans of the forest were on mechanisms that were ancient and inaccessible.

If the mechanisms failed, they would all die; to Arrow Maker it was as simple, and as unforgettable, as that.

Garry Uvarov was an old fool in a wheelchair, with no obvious influence on the mechanisms which kept them all alive. And yet, it seemed undoubtedly true that he was indeed as old as he claimed - that he was a thousand years old, as old as the ship itself - *that he remembered Earth.*

Uvarov was a link with the days of the ship’s construction. Arrow Maker felt, with a deep, superstitious dread, that if Uvarov were to die - if that tangible link to the past were ever broken - then perhaps the ship itself would die, around them.

And then, how could they possibly survive?

He looked at his daughter, troubled, wondering if he would ever be able to explain this to her.

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9

Lieserl roused - slowly, fitfully - from her long sleep.

She stirred, irritated; she peered around, blinking her Virtual eyes, trying to understand what had disturbed her. Motion of some kind?

Motion, in this million-degree soup?

Virtual arms folded against her chest, legs tucked beneath her, she floated slowly through the compressed plasma of the radiative zone. Around her, all but unnoticed, high-energy photons performed their complex, million-year dance as they worked their way out of the core towards the surface.

After all this time, she had drifted to within no more than a third of a Solar radius of the centre of the Sun itself.

She ran brief diagnostic checks over her remaining data stores. She found more damage, of course; more cumulative depredation by the unceasing hand of entropy. She wondered vaguely how much of her original processing and memory capacity she was left with by now. Ten per cent? Less, perhaps?

How would she *feel*, if she roused herself to full awareness now? She'd never used her full capacity anyway - there was immense redundancy built into the systems - but she would surely be aware of some loss: gaps in her memory, perhaps, or a degradation of her sense of her Virtual body - a numbness, imperfectly realized skin.

Lieserl, she told herself, *you're getting old, all over again. The first human in history to grow old for the second time.*

Another first, for the freak lady.

She smiled and snuggled her face closer to her knees. Once, her depth of self-awareness and her ability to access huge memory stores had made her the most conscious human - or quasi-human, anyway - in history. So she'd been told.

Well, that couldn't be true any more.

Always assuming there were still humans left to compare herself to, of course.

Plasma still poured through the faces of the Interface which cradled her ancient, battered data stores; somewhere beyond the Sun, the energy dumped through the refrigerating wormhole must still blaze like a miniature

star, perhaps casting its shadows across the photosphere. She knew the wormhole refrigerating link must be operating still, and that the various enhancements the engineers had made to it, as she'd gone far beyond her design envelope in her quest deeper into the Sun, must still be working. After a fashion, anyway.

She knew all that, because if the link wasn't working, she would be dead.

It was even conceivable that there were still people at the other end of the wormhole, getting useful data out of the link. In fact, she vaguely hoped so, in spite of everything. That had been the point of this expedition in the first place, after all. Just because they no longer chose to speak to her didn't mean they weren't *there.*

Anyway, it scarcely mattered; she'd no intention of waking out of the drowsy half-sleep within which she had whiled away the years - and centuries, and millennia . . .

But there was that hint of motion again. Something elusive, transient—

It was no more than a shadow, streaking across the rim of her sensorium, barely visible even to her enhanced senses. She tried to turn, to track the elusive ghost; but she was stiff, clumsy, her 'limbs' rusty from centuries of abandonment.

The fizzing shadow arced across her vision again, surging along a straight line and out of her sight.

Working with unaccustomed haste, she initiated self-repair routines throughout her system. She analysed what she'd seen, decomposing the compound image presented to her visually into its underlying component forms.

She felt dimly excited. If she'd been human still, she knew, her heart would be beating faster, and a surge of adrenaline would make her skin tighten, her breathing speed up, her senses become more vivid. For the first time in historic ages she felt impatience with the cocoon of shut-down Virtual senses which swaddled her; it was as if the machinery stopped her from *feeling* . . .

She considered the results of her analysis. The image scarcely existed; no wonder it had looked like a ghost to her. It was no more than a faint shadow against the flood of neutrinos from the Solar core, a vague

coherence among scintillas of interaction with the slow-moving protons of the plasma . . .

The shadow she'd seen had been a structure of dark matter. A thing of photinos, orbiting the heart of the Sun.

She felt jubilant. *At last* - and just at the depth, a third of a Solar radius out from the centre, that she and Kevan had deduced it would be all those years ago, she'd found what she'd come here for - the prize for which her humanity had been engineered away. At last she'd penetrated to the edge of the Sun's dark matter shadow core, to the near-invisible canker which was smothering its fusion fire.

She waited for the photino object to return.

Arrow Maker slid towards the ground.

He passed through another layer of leaves: this was the forest's understorey, made up of darkness-adapted palms and a few saplings, young trees growing from seeds dropped by the canopy trees. The light at this level - even now, at midday - was dim, drenched in the green of the canopy. The air was hot, stagnant, moist.

Arrow Maker reached the ground, close to the base of a huge tree. Under one of his bare soles, a beetle wriggled, working its way through decaying leaf matter. Arrow Maker reached down, absently, picked up the beetle and popped it into his mouth.

He hauled his rope down from the tree and set off across the forest floor.

Beneath the thin soil he could feel the tree's thick mat of rootlets. The trees were supported by immense buttresses: triangular fins, five yards wide at their base, which sprouted from the clustering trunks. A thin line of termites - a ribbon hundreds of yards long - marched steadily across the floor close to his feet, on their way to the tree trunk cleft that housed their nest.

He passed splashes of colour amid the corruption of the forest floor - mostly dead flowers, fallen from the canopy - but there was also one huge rafflesia: a single flower a yard across, leafless, its maroon petals thick, leathery and coated with warts. A revolting stench of putrescence came from its interior, and flies, mesmerized by the scent, swarmed around the vast cup.

Arrow Maker, preoccupied, walked around the grotesque bloom.

' . . . Where in Lethe have you been?'

Uvarov's chair came rolling towards Maker, out of the shadows of his shelter.

Maker, startled, stumbled backwards. 'I stopped to gather figs. They were ripe. I met my daughter - Spinner-of-Rope - and—'

Garry Uvarov was ignoring him. Uvarov rolled his chair back into the shelter, its wheels heavy on the soft forest floor. 'Tell me about the stars you saw,' he hissed. 'The *stars* . . .'

Uvarov's shelter was little more than a roof of ropes and palm leaves, a web suspended between a cluster of tree trunks. Beneath this roof the jungle floor had been cleared and floored over with crudely cut planks of wood, over which Uvarov could prowl, the wheels of his chair humming as they bore him to and fro, to and fro. There were resin torches fixed to the walls, unlit. Uvarov kept his few possessions here, most of them incomprehensible to Arrow Maker: boxes fronted by discs of glass, bookslates worn yellow and faded with use, cupboards, chairs and a bed into which Uvarov could no longer climb.

None of this had ever worked in Arrow Maker's lifetime.

Garry Uvarov was swaddled in a leather blanket, which hid his useless limbs. His head - huge, skull-like, fringed by sky-white hair and with eyes hollowed out by corruption - lolled on a neck grown too weak to support it. If Uvarov could stand, he'd be taller than Arrow Maker by three feet. But, sprawled in his chair as he was, Uvarov looked like some grotesque doll, a crude thing constructed of rags and the skull of some animal, perhaps a monkey.

Maker studied Uvarov uneasily. The old man had never exactly been rational, but today there seemed to be an additional edge to his voice - perhaps a knife-edge of real madness, at last.

And if that was true, how was he - Arrow Maker - going to deal with it?

'Do you want anything? I'll get you some—'

Uvarov lifted his head. 'Just tell me, damn you . . .' His leaf-like cheeks shook and spittle flecked his chin, signifying rage. But his voice - reconstructed by some machine generations ago - was a bland, inhuman whisper.

'I climbed the kapok - the tallest tree . . .' Arrow Maker, stumbling, tried to describe what he'd seen.

Uvarov listened, his head cocked back, his mouth lolling.

‘*The starbow*,’ he said at last. ‘Did you see the starbow?’

Arrow Maker shook his head. ‘I’ve never seen a starbow. Tell me what it looks like.’

Rage seemed to have enveloped Uvarov now; his chair rolled back and forth, back and forth, clattering over loose floorboards. ‘I knew it! No starbow . . . The ship’s slowing. We’ve arrived. I knew it . . .

‘They’ve tried to exclude me. Those survivalist bastard Planners, and maybe even that wizened bitch Armonk. If she’s still alive.’ He wheeled about, trying to point himself at Arrow Maker. ‘Don’t you see it? If there’s no starbow *the ship must have arrived*. The journey is over . . . After a thousand years, we’ve returned to Sol.’

‘But you’re not making sense,’ Arrow Maker protested weakly. ‘There’s never been a starbow. I don’t know what—’

‘The bastards . . . The bastards.’ Uvarov continued his endless rolling. ‘We’ve returned, to fulfil our mission - *Paradoxa*’s mission, not Louise Ye bloody Armonk’s! - and they want to shut me out. You, too, my children . . . My immortal children.

‘Listen to me.’ Uvarov wheeled about to face Maker again. ‘You must hear me; it’s very important. You’re the future, Arrow Maker . . . You, poor, ignorant as you are: *you* and your people are the future of the species.’

He wheeled to the lip of his flooring, now, and lifted his head to Arrow Maker. Maker could see pools of congealed blood at the pits of those empty eye sockets, and he recoiled from the heavy, fetid stink of the decaying body under its blanket. ‘You’ll not be betrayed by your damn AS nanobots the way I was. When the ‘bots withered my limbs and chopped up my damn eyes, five centuries ago, I saw I’d been right all along . . .

‘But now we’ve come home. The mission is over. That’s what the stars are telling you, if you only had eyes to see.

‘I want you to gather the people. Get weapons - bows, blowpipes - anything you can find.’

‘Why?’

‘Because you’re going to go back into the Decks. For the first time in centuries. You have to reach the Interface. *The wormhole Interface*, Maker.’

The Decks . . .

Arrow Maker tried to envisage going *through* the Locks in the forest floor, entering the unknown darkness of the endless levels beneath his feet.

Panic rose, sharp and painful in his throat.

Maker stumbled away from the little hut, and back into the familiar scents of the jungle. He raised his face to the canopy above, and the glowing sky beyond.

Could Uvarov be right? Was the thousand-year journey over - at last?

Suddenly Arrow Maker's world seemed tiny, fragile, a mote adrift among impossible dangers. He longed to return to the canopy, to lose himself in the thick, moist air, in the scent of growing things.

'Milpitas was right,' Constancy-of-Purpose said. 'Your trouble is you think too much, Morrow.' Her big voice boomed out, echoing from the bare metal walls of Deck One; Constancy-of-Purpose seemed oblivious of the huge emptiness around them - the desolate dwellings, the endless, shadowed spaces of this uninhabited place.

Constancy-of-Purpose opened up a Lock. The Lock was a simple cylinder which rose from the floor and merged seamlessly with the ceiling, a hundred yards above their heads. Constancy-of-Purpose had opened a door in the Lock's side, but there was also (Morrow had noticed) a hatch inside the cylinder twenty feet above them, blocking off the cylinder's upper section.

All the Locks were alike. But Morrow had never seen an upper hatch opened, and knew no one who had.

Today, this Lock contained a pile of pineapples, plump and ripe, and a few flagons of copafeira sap. Morrow held open a bag, and Constancy-of-Purpose started methodically to shovel the fruit out of the Lock and into the bag, her huge biceps working. 'You have to accept things as they are,' she went on. 'Our way of life here hasn't changed for centuries - you have to admit that. So the Planners must be doing *something* right. Why not give them the benefit of the doubt?'

Constancy-of-Purpose was a big, burly woman who habitually wore sleeveless tunics, leaving the huge muscles of her arms exposed. Her face, too, was strong, broad and patient, habitually placid beneath her shaven scalp. The lower half of her body, by contrast, was wasted, spindly, giving her a strangely unbalanced look.

Morrow said to Constancy-of-Purpose, 'You always talk to me as if I were still a child.' As, in Constancy-of-Purpose's eyes, he probably always would be. Constancy-of-Purpose was twenty years older than Morrow, and

she had always assumed the role of older mentor - even now, after five centuries of life, when a mere couple of decades could go by barely noticed. The fact that they'd once been married, for a few decades, had made no long-term difference to their relationship at all. 'Look, Constancy-of-Purpose, so much of our little world just doesn't make sense. And it drives me crazy to think about it.'

Constancy-of-Purpose straightened up and rested her fists on her hips; her face gleamed with sweat. 'No, it doesn't.'

'What?'

'It *doesn't* drive you crazy. Nobody as old as you - or me - is capable of being driven crazy by anything. We don't have the energy to be mad any more, Morrow.'

Morrow sighed. 'All right. But it *ought* to drive me crazy. And you. There's so much that is simply - *unsaid*.' He hoisted the half-full sack of fruit. 'Look at the work we're doing now, even. This simply isn't *logical*.'

'Logical enough. Copafeira sap is a useful fuel. And we need the fruit to supplement the supply machines, which haven't worked properly since—'

'Yes,' Morrow said, exasperated, 'but where does the fruit *come* from? Who brings it here, to these Locks? And—'

'And what?'

'And what do they want with the ratchets, and knives, and figure-of-eight rings we bring *them*?'

Morrow picked up the sap flagons, and Constancy-of-Purpose slung the fruit bag over her shoulder. They began the hundred-yard walk to the next Lock. Constancy-of-Purpose moved with an uneven, almost waddling motion, her stick-like legs seeming almost too weak to support the massive bulk of her upper body. Some obscure nanobot failure had left her legs shrivelled, spindly and - Morrow suspected, though Constancy-of-Purpose never complained - arthritic.

'I don't know,' said Constancy-of-Purpose simply. 'And I don't think about it.' She looked sideways at Morrow.

'But it doesn't make *sense*.' Morrow looked up, nervously, at the bulkhead above him. 'This fruit must come from *somewhere*. There must be *people* up there, Constancy-of-Purpose - people we've never seen, whose existence has never been acknowledged by the Planners, or—'

'People whose existence doesn't matter a damn, then.'

‘But it *does*. We *trade* with them.’ He stopped and held out his sack of fruit. ‘Look at this. We’ve carried on this trade with them - thereby implicitly acknowledging their existence - for decades now.’

Constancy-of-Purpose kept walking, painfully. ‘Centuries, actually.’

When he was a young man, Morrow had been angry just about the whole time, he recalled. Now - even now - he felt a ghostly surge of that old anger. He felt obscurely proud of himself: a feeling of anger was as rare an event as achieving an erection, these days. ‘But that means our society is, at its core, slightly insane.’

Constancy-of-Purpose shook her massive head and studied Morrow, a tolerant look on her face. ‘Keep up that talk, and you’ll spend the rest of your life up here. Or somewhere worse.’

‘Just think about it,’ Morrow said. ‘A whole society, labouring under a mass delusion . . . No wonder they shut down the Virtuals. No wonder they banned *kids*.’

‘But we’re all kept fed. Aren’t we? So it can’t be that crazy.’ She smiled, her broad face assuming a look of wisdom. ‘Humans are a very flawed species, Morrow. We simply don’t seem to be able to act rationally, for very long. This sort of thing - a trade with the nonexistent unknowns upstairs - seems a minor aberration to me.’

Morrow studied her curiously. ‘You believe that? And I think of *me* as sceptical.’

Constancy-of-Purpose had reached the next Lock; she dropped her sack and leant against the curving metal wall, her hands resting on her knees. ‘You know, we have this conversation every few years, my friend.’

Morrow frowned. ‘Really? Do we?’

‘Of course.’ Constancy-of-Purpose smiled. ‘At our age, even *doubting* becomes a habit. And we never come to any conclusion, and the world goes on. Just as it always has.’ She straightened up, cautiously flexing her thin legs. ‘Come on. Let’s get on with our work.’

With a twist of her huge upper arms Constancy-of-Purpose hauled open the door of the Lock.

Then - instead of stepping forward to gather the foodstuffs - she frowned, and looked at Morrow uncertainly. ‘I don’t understand.’

‘What is it?’

‘Look.’

The Lock was *empty.*

Morrow stared at Constancy-of-Purpose, and then into the empty chamber. He couldn't take in what he was seeing. These trades had *never* gone wrong before.

'The knives have gone,' he said.

'We left them here yesterday.'

'But there's no meat.'

'But the scratches clearly said the knives were what they wanted . . .'

This dialogue went on for perhaps five minutes. Part of Morrow was able to step outside - to look at himself and Constancy-of-Purpose with a certain detachment, even with pity. Here were two old people, too hopelessly habit-bound to respond to the unexpected.

Constancy-of-Purpose is right. I've become like a machine, he thought with anger and sadness. *Worse than a machine.*

Constancy-of-Purpose said, 'I'll go in and check the markings. Maybe we made some mistake.'

'We never made a mistake before. How could we?'

'I'll go check anyway.'

Constancy-of-Purpose stepped forward into the Lock and peered up, squinting, at the trade markings.

. . . And the hatch at the top of the Lock, twenty feet above Constancy-of-Purpose's head, *started to open.*

Inside the plasma sea, time held little meaning for Lieserl.

As she sank into the Sun she'd abandoned all her Virtual senses, save for sight and a residual body awareness; drifting through the billowing, cloudy plasma was like a childhood vision of sleep, or an endless, oceanic meditation. She'd slowed the clocks which governed her awareness, and allowed herself to slip into long periods of true 'sleep' - of unawareness, when she drifted with only her autonomic systems patiently functioning.

And she had allowed, without regret, the crucial link of synchronization between her sensorium and the Universe outside to be severed. While she had drifted around the core of the Sun, sinking almost imperceptibly deeper into its heart, dozens of centuries had worn away on the worlds of mankind . . .

Here came the photino structure again.

This time she was ready. She strained at the structure as it passed her, every sense open.

Still, she could barely make it out; it was like a crude charcoal sketch against the glowing plasma background.

Wistfully she watched the photino cloud soar out of sight once more, passing through the plasma as if it were no more substantial than mist, on its minutes-long orbit around the Sun.

But—'

But, had it *diverged* from its orbit as it passed her? Was it possible that the photino object had actually reacted to her presence?

Now she became aware of more motion, below and ahead of her. The moving forms were shadowy, infuriatingly elusive against the gleaming, almost featureless background. Frustrated, she strained at her senses, demanding that her aged processors extract every last bit of information content from the data they were receiving.

Slowly the images enhanced, gaining in definition and sharpness.

There were hundreds - no: thousands, *millions* - of the photino traces. Maybe they were standing-wave patterns, she wondered, traces of coherence on the dark matter cloud.

Slowly she built up an image in her head, a composite model of the patterns: a roughly lenticular form, with length of perhaps fifty yards - and, she realized slowly, some hints of an internal structure.

Internal structure?

Well, so much for the standing-wave theory. These things seemed to be discrete *objects*, not merely patterns of coherence in a continuum.

She watched the objects as they traced their orbits around the centre of the Sun. The soaring lens-shapes reminded her of graphics of the contents of a blood stream; she wondered if the structures were indeed like antibodies, or thrombocytes - blood platelets, swarming in search of a wound. They swarmed over and past each other, miraculously never colliding—

No, she realized slowly. There was nothing *miraculous* about it. The objects were *steering* away from each other, as they soared through their orbits.

This was a flock. The dark matter structures were *alive.*

Alive and purposeful.

Slowly she drifted into the flock of photino birds (as she'd tentatively labelled them). They swooped around her, avoiding her gracefully.

They were clearly reacting to her presence. They were obviously *aware* - if not intelligent, she thought.

She wondered what to do next. She wished she had Kevan Scholes to talk to about this.

Sweet, patient Kevan had come to the Sun as a junior research associate; his tour of duty had been meant to be only a few years. But he'd stayed on much longer in near-Solar orbit to serve as her patient capcom, far beyond the call of duty or friendship. In the end her long-distance relationship with Scholes had lasted decades.

Well, she'd been grateful for his loyalty. He'd helped her immeasurably through those first difficult years inside the Sun.

Fitfully, she tried to remember the last time he spoke to her.

In the end he'd simply been removed. Why? To serve some organizational, political, cultural change? She'd never been told.

She had come to learn, with time, that human organizations - even if staffed by AS-preserved semi-immortals - had a half-life of only a few decades. Those that survived longer persisted only as shells, usually transmuted far from the aims of their founders. She thought of the slow corruption of the Paradoxa Collegiate, apparent even in her own brief time outside the Sun, into a core organization of fanatics huddled around some eternal flame of ancient belief.

A succession of capcoms had taken their places at the microphones at the other end of her wormhole link. She'd been shown their faces, by images dumped through the telemetry channels. So she knew what they looked like, that parade of ever more odd-looking men and women with their evanescent fashions and styles and their increasing remoteness of expression. Language evolution and other cultural changes were downloaded into her data stores, so the drift of the human worlds away from the time she'd grown up in (however briefly) didn't cause her communication problems. But none of it *engaged* her. After Kevan Scholes she found little interest in, or empathy with, the succession of firefly people who communicated with her.

Sometimes she had wondered how she must seem to *them* - a cranky, antique quasi-human trapped inside a piece of rickety old technology.

Then, at last, they had stopped talking to her altogether.

Oddly, though, she still felt - in spite of everything - *loyal* to humanity. They'd manufactured her quite cynically for their own purposes and finally abandoned her here, in the heart of this alien world; and yet she couldn't cut herself off from people, in her mind. After all, whether they would speak to her or not, her wormhole refrigeration link could easily have been closed down - her consciousness terminated - as trivially as turning out a light. But that hadn't happened.

So, she thought resentfully, they hadn't bothered to kill her off. For this did she owe them loyalty? She tried to be cynical. Should she have to bow and scrape, just for the favour of her continuing life?

But, despite her determination to be tough-minded, she found she retained a residual urge to *communicate* - to broadcast her news beyond the Sun, to tell all she had found out about the photino birds - just in case anyone was listening.

It wasn't logical. And yet, she did care; it was a nagging sense of responsibility - even of duty - that she simply couldn't flush out of her consciousness.

After a time, in fact, she had begun to grow suspicious of this very persistence. After all, she had represented quite an investment, for the Paradoxa of her time. Her brief had been to find out what was happening to the Sun, and she could only fulfil her brief, clearly, if she reported back to *somebody*. So maybe the need to communicate, even with non-receptive listeners, had been deeply embedded into the programming of the systems which underlay her awareness. Perhaps it was even hard-wired into the physical systems.

After all this time, they're still manipulating me, she thought sourly.

But even if that were true, there wasn't much she could do about it; the result was, though, that she was left with an irritating itch - and no way to scratch it.

Morrow simply stared. He didn't feel fear, or curiosity. The upper hatch had never opened before. And - even though his eyes told him otherwise - it couldn't be happening now.

Beyond the hatch was a tunnel, rising upwards - the tunnel was the inside of the cylindrical Lock, he realized. The light from above the hatch

was dim, greenish. The air from the cylinder felt hot, humid, laden with secret, fruit-like scents.

He tried to find some appropriate response, to formulate some plan; but this new event skittered across the habit-worn surface of his mind like mercury across glass, unable to penetrate. He could only watch the events unfold, one after the other, as if he had been reduced to the state of a child, unable to connect incidents in any causal sequence.

Constancy-of-Purpose, too, seemed to be having trouble accepting any of this. She stood in the Lock with her head tipped back, gazing up, mouth slack . . .

Then there was a hissing noise, a soft, moist impact.

Constancy-of-Purpose clutched her arm.

She looked at Morrow with blank incomprehension - and then it was as if her wizened legs had failed her at last, for they crumpled, slowly, bearing her down to the floor of the Lock. For a few seconds she sat, her legs folded awkwardly under her. She looked surprised, confused. Then the great torso toppled sideways; sending the legs sprawling.

At last Morrow was able to move. He rushed into the Lock and, with effort, hauled Constancy-of-Purpose upright. Constancy-of-Purpose's eyes were open but only the whites were showing; spittle drooled from her mouth. Her skin felt moist, cold. Morrow searched frantically for a pulse at Constancy-of-Purpose's wrist, then amid the massive tendons of her, neck.

A rope curled down from the hatch above, fraying, brown. Someone - *something* - descended, hand-over-hand, dropping lightly to the floor.

Morrow tried to study the invader, but it was as if he couldn't even *see* him - or her. This was simply too strange, too shocking; his eyes seemed to slide away from the invader, as if refusing to accept its reality.

Cradling Constancy-of-Purpose in his arms, he forced himself to take this one step at a time. First of all: *human*, certainly. He stared at four limbs, startlingly bright eyes behind spectacles, white teeth. Very short, no more than four feet tall. A child, then? Perhaps - but with the form, the breasts and hips, of a woman. And clothed in some suit of brown, with colourful flashes; dungarees, perhaps, which—

No. He forced himself to *see*. Save for a belt at the waist, bulging with pockets, this person was *naked*. Her skin was a rich brown. Her head was shaven at the scalp, but sported a fringe of thick, black, oiled hair. A mask

of red paint sliced across her nose and eyes. She was carrying a long, fine-bored tube of wood. Her face was round - not pretty, but . . .

But *young*. She couldn't be more than fifteen or sixteen years old.

But it wasn't possible to AS-preserve at that age. So this was a *child* - a genuine child; the first he'd seen in five centuries.

She raised the tube warily, as if preparing to strike him, or fend him off.

'My name is Spinner-of-Rope,' she said. 'I won't hurt you.'

The old Underman was *grotesque*. Nearly as bad as Uvarov: bald, skinny, faded skin, dressed in some kind of stuffy, drab garment - and as tall as Uvarov would be, if he was laid out lengthways.

The Underman's unconscious friend, the woman, was worse, with that huge upper body and spindly legs. The pair of them looked so *old*, so unnatural.

She felt revolted. There was an air of corruption about these people: of decay, of mould. She wanted to destroy them, get away, back to the clean air of the forest—

'What's happening?' Maker's voice came booming down the Lock shaft. 'Spinner? Are you all right?'

She forced herself to put aside her emotions, to *think*. This tall old man was disgusting. But he was clearly no threat.

'Yes,' she called up the shaft. 'I'm fine, Arrow Maker. Come down.'

She waited in silence for the few minutes it took her father - grunting, clumsy - to work his way down the rope from the forest floor. At last he dropped the last few feet to the Deck; he landed at a crouch, with his knife in one hand.

He was startled to find the two Underpeople there, but he seemed to take in the situation quickly. 'Is she dead? Are you all right?'

'No, and yes.' She held up her blowpipe, apologetically. 'I used this. Now, I don't think I needed to. I—'

'It doesn't matter.'

The old Underman's eyes were pale blue and watery; he seemed to be having trouble focusing on them. He pointed at the blowpipe. 'You killed Constancy-of-Purpose . . . with that?' His accent was strange, lilting, but quite comprehensible.

Spinner hesitated. 'No . . .' She held out the pipe to him, but the Underman didn't take it; he simply sat cradling his friend. 'The pipe is

bamboo. You give the darts an airtight seal inside the pipe with seed fibres. You get the poison from frogs, roasted on a spit, and—'

'We're sorry about your friend,' Arrow Maker said. 'She will recover. And it was - unnecessary.'

The Underman looked defiant. 'Yes, he said. 'Yes, it damn well was.' He looked from one to the other. 'What do you want?'

Spinner and her father looked at each other, uncertainly. At length Arrow Maker said, 'We've an old man. Uvarov. He says he remembers Earth. And he says that the journey's over - that the starship has arrived at its destination. And now we must travel to the Interface.' Maker looked at the Underman, hesitant, baffled. 'Will you help us? Will you lead us to the Interface?' Then his expression hardened. 'Or must we fight our way past you, as Uvarov predicts?'

The Underman stared at Maker. Somehow, Spinner thought, he seemed to be emerging from his paralysis and confusion. '*Uvarov* - *Interface* - I've no idea what you're talking about . . .'

Then, unexpectedly, he said wonderingly, 'But I've heard of Earth.'

The three of them stood in the cold light of the Lock, studying each other with fearful curiosity.

She descended deeper into the Sun, through the core-smothering flock of photino birds. The birds soared past and around her, tiny planets of dark matter racing through their tight Solar orbits.

The birds continually nudged towards or away from each other, like a horde of satellites manoeuvring for docking. Many of the transient clusters which they formed - and swept by her, too fast to study properly - seemed immensely complex, and she stored away a succession of images. There had to be a *reason* for all this activity, she thought.

Some of the motion, on the fringe of the spherical flock, was simpler in pattern and easier to interpret.

Individual photino birds sailed in from beyond the flock, sweeping through the outer layers of the Sun on hyperbolic paths, and settled into the swarm of their orbiting cousins. Occasionally a bird would break away from the rest, and go soaring off on open trajectories to—

To where? Back to some diffuse ocean of dark matter beyond the Sun? Or to some other star?

And if so, why?

Patiently she watched the birds coming and going from their flock, letting the patterns build up in her head.

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10

The hatch at the top of the Lock was jammed open, revealing a circle of luxuriant of greenery. It was a window to another world. The howls of a troupe of some unimaginable animals echoed down into the metal caverns of Deck One.

Morrow stood at the base of the Lock shaft, trying to suppress the urge to *run*, to bury himself again in the routine rhythms of his everyday life.

Squatting around the rim of the upper hatch, peering down at Morrow, were four or five of the forest folk. They were all naked, their bare, smooth skins adorned with splashes of fruit-dye colour, and they seemed impossibly young. Between them they were supporting a cradle of rope, and suspended in the cradle - descending slowly, shakily as the forest folk paid out lengths of rope - was Garry Uvarov.

The head of the extraordinary ancient protruded from a mass of thick blankets. Through the blankets Morrow could make out the chunky, mechanical box-shape of the mobile chair which sustained Uvarov, so that Uvarov looked nearly inhuman - as if he had been merged with his chair, a bizarre, wizened cyborg.

The girl with the spectacles - *Spinner-of-Rope* - came to stand beside Morrow, at the bottom of the shaft. She wore a loose necklace of orchid-petals, and little else. Her head was at a level with Morrow's elbow, and - now that he was growing used to her - her fierce crimson face paint looked almost comical. She touched his arm; her hand was delicate, small, impossibly light. 'Don't be afraid,' she said.

He was startled. 'I'm not afraid. What is there to be afraid of? Why do you think I'm afraid? If I was afraid, would I be here helping you?'

'It's the way you look. The way you're standing.' She shrugged her bare shoulders. 'Everything. Uvarov looks like - I don't know; some huge larva - but he's just a human. A very old human.'

'Actually I was thinking he looks like a kind of god. A half-human, half-mechanical god. With you people as his attendants.'

She wrinkled her small nose and pushed her spectacles further up her face, smudging the paint on her cheeks; glaring up at him, she looked irritated. 'Really. Well, we aren't superstitious savages. As you Undermen think we are. Don't you?'

‘No, I—’

‘We know Uvarov is no god. He’s just a man - although a very ancient, strange and special man; a man who seems to remember what this ship was actually *for.*

‘Morrow, I live in a tree and make things out of wood, and vine. You live—’ she waved a hand vaguely ‘—in some boxy house somewhere, and make things out of metal and glass. But that’s the only difference between us. My people aren’t primitives, and we aren’t ignorant. We *know* that we’re all living inside a huge starship. Maybe we understand that better than you do, since we can actually see the sky.’

But that’s not the point. You and I are different, he thought, exasperated. *More different than you can understand.*

Spinner-of-Rope was a fifteen-year-old girl - lively, inquisitive, fearless, disrespectful. It had been five centuries since Morrow had been fifteen. Even then, he would have found Spinner a handful. Morrow suspected, wistfully, that Spinner was more alien to him than Garry Uvarov.

One of the forest folk walked up to them. Through a sparse mask of face paint the man smiled up at Morrow. ‘Is she giving you a hard time?’

Spinner snorted resentfully.

Morrow stared down at the newcomer, trying to place him. *Damn it, all these little men look the same*—He remembered; this was Arrow Maker, Spinner’s father. He made an effort to smile back. ‘No, no. Actually I think she was trying to comfort me. She was explaining I shouldn’t be frightened of old Uvarov.’

Uvarov’s chair bumped down on the surface of Deck One. Tree people clustered around Uvarov, loosening the ropes around the chair; the ropes were pulled back up through the hatch above them, snaking up like living things. Uvarov’s sightless eye sockets opened, and he growled instructions to his attendants.

Arrow Maker was watching Morrow’s face. ‘And *do* you fear Uvarov?’

Morrow became aware that he was pulling at his fingers, his motions tense, stabbing; he tried to be still. ‘No. Believe me, in my world, there are many AS-FAILURE cases just as - ah, startling - as Uvarov. Though perhaps no one quite so *old*.’

Spinner-of-Rope approached them. ‘Uvarov’s ready. So unless you want to stand here talking all day, I think we should get on . . .’

The little party formed up on Deck One. Morrow led the way, at a slow walking pace. Uvarov in his chair followed him, the chair's hidden motor whirring noisily. Arrow Maker and Spinner flanked the chair, guiding the sightless Uvarov with gentle, wordless touches on his shoulder.

As the forest folk walked across the Deck, their feet padded softly on the worn metal; they left behind a trail of marks, imprints of forest dirt and sweat. Arrow Maker wore a bow and quiver, slung over his shoulder, and Spinner's blowpipe dangled at her waist, obscure and deadly. Their bare, painted flesh made splashes of extraordinary colour against the drab grey-brown shades of the Decks. Their eyes, peering through bright masks of paint, were wide with alert suspicion and wariness, an effect hardly softened by Spinner's eye-glasses.

Morrow had managed to arrange an interview with Planner Milpitas. He had decided to restrict this venture into the interior of the Decks - this first mixture of cultures in centuries of the ship's two worlds - to just these three. He didn't want to expose the society of the Decks to any more cultural stress than he had to.

They moved away from the open Lock, with its last glimpse of the forest, and entered the metal-walled environment typical of the Decks. Spinner's gait, at first confident, became more hesitant; she seemed to lose some of her brashness, and turned pale under her face paint.

Morrow felt a certain relish. 'What's the matter with you? Nervous?'

She looked at him defiantly, swallowing hard. 'Shouldn't I be? Aren't you?'

Arrow Maker began, 'Spinner—'

'But it's not that.' She wrinkled up her round face, making her glasses slip on her nose. 'It's the *stench*. It's everywhere. Oppressive, stale . . . Can't you smell it?'

Morrow raised his face, vaguely alarmed. Even old Uvarov, blind, trapped in his chair, turned his face, dragging air through his ruin of a nose.

Morrow said, 'I don't understand . . .'

'Spinner.' Arrow Maker's voice was patient. 'I don't think there's anything wrong. That's just - *people*. People, and metal, and machinery. It's a different world down here; we'll have to learn to accept it.'

Spinner looked briefly horrified. 'Well, it's disgusting. They should do something about it.'

Morrow felt exasperated and amused. ‘Do something? Like what?’

‘Like plant a few trees.’ Defiantly, she lifted the orchid garland around her neck and pressed it against her face, ostentatiously breathing in the petals’ scent.

Arrow Maker walked beside Morrow. ‘She does not mean to give offence,’ he said seriously.

Morrow sighed. ‘Don’t worry about that. But . . . I’m an old man, Arrow Maker. Older than you can understand, perhaps.’ He glanced sideways at the little man from the forest. Arrow Maker looked competent, practical - and his four-feet-tall body, his bare feet and his painted face were utterly out of place in the sterile surroundings of Deck One. ‘I’m a bit more restless than most people down here. And I’ve had enough trouble over that. But, even so, I’m *old*. I can’t help but fear *change* - unpredictability - more than anything else. You people represent an enormous irruption into the Decks - almost an invasion. My life will never be the same. And that’s uncomfortable.’

Arrow Maker slowed. ‘Will you help us?’ he asked levelly. ‘You said—’

‘Yes, I’ll help you. I won’t lose my nerve, Arrow Maker; I’ll keep my word. I’ve been aware for a long time that the way things are run, down here, isn’t *logical*. Maybe, by helping you - by helping Uvarov - I’ll be able to make sense of a little more of it. Or maybe not.’ *At least*, he thought, *now I understand what all those ratchets and loops of metal I’ve been making for so many decades are actually for*. He grinned and ran a hand over his shaven head. ‘But I don’t quite know what’s going to come out of this. You’re so - *different*.’

Arrow Maker smiled. ‘Then being fearful - cautious, at least - is the only rational response.’

‘Unless you’re fifteen years old.’

‘I heard that.’ Spinner rejoined them; she punched Morrow, lightly, in the ribs; her small, hard fist sank into layers of body-fat, and he tried not to react to the sudden, small pain.

They descended a ramp, and passed down from Deck One and onto Deck Two, the first of the inhabited levels.

Morrow tried to see his world through the fresh eyes of the forest people. The drab, stained surfaces of the bulkheads above and below, the distant, slightly mist-shrouded, hull walls, all provided a frame around the

world - regular, ordered, enclosed. Immense banners of green copper-stain disfigured one hull wall. Stair-ramps threaded between the Decks like hundred-yard-long traceries of spider-webs, and the elevator shafts were vertical pillars which pierced the levels, apparently supporting the metal sky. The rigid circular-geometry layout of Deck Two was easy to discern. Buildings - homes, factories, the Planners' Temples - clustered obediently in the Deck's neat sectors and segments.

Morrow felt embarrassed, obscurely depressed. His world was unimaginative, constricting - like the interior of some huge machine, he thought. And a battered, failing, ageing machine at that.

They set off down a chord-way which ran directly to Milpitas' Temple.

A woman came near them. Morrow knew her - she was called Perpetuation; she ran a shop in a poor part of Sector 4. She walked steadily along the way towards them, eyes downcast. She looked tired, Morrow thought; it must be her shift end.

Then she looked up, and saw the forest folk. Perpetuation slowed to a halt in the middle of the chord-way, her mouth hanging slack. Morrow saw beads of sweat break out over her scalp.

In his peripheral vision, Morrow saw Spinner-of-Rope reach for her blowpipe.

He raised a hand and tried to smile. 'Perpetuation. Don't be alarmed. We're on our way to the Temple, to . . .'

He let his voice trail off. He could *see* Perpetuation wasn't hearing him. In fact, she seemed to be having difficulty in believing the evidence of her own eyes; she kept looking *past* Morrow's party, along the chord-way towards her home.

It was as if the forest party didn't exist - *couldn't* exist - for her.

She looked absurd. But she reminded Morrow, disturbingly, of his own first reaction to Spinner-of-Rope.

Perpetuation scurried off the path, ran *around* them, and continued on her way without looking back. Spinner seemed to relax. She slung her blowpipe over her shoulder once more.

'For the love of Life,' Morrow snapped at the girl, suddenly impatient, 'you were in no danger from that poor woman. She was terrified. Couldn't you see that?'

Spinner returned his stare, wide-eyed.

Uvarov turned up his blind face; Arrow Maker explained briefly what had happened. Uvarov barked laughter. ‘You are wrong, Morrow. Of *course* Spinner was in danger here. We all are.’

Arrow Maker, plodding beside Morrow, frowned. ‘I don’t understand. This place is strange, but I’ve seen no danger.’

Morrow said, ‘I agree. You’re under no threat here . . .’

Uvarov laughed. ‘You think not? Maker, try to remember this lesson. It might keep you alive a little longer. The most precious thing to a human being is a *mind-set:* more precious than one’s own life, even. Human history has taught us that lesson time and again, with its endless parade of wars - human sacrifices *en masse* - thousands of deaths over the most trivial of differences of religious interpretation.

‘We do not fit into the mind-set of the people within these Decks. That poor woman walked *around* us, convincing herself we are not real! By our presence here - by our very existence, in fact - we are disturbing the *mind-set* of the people here . . . in particular, of those ancients who control this society.

‘They may not even realize it themselves, but they will seek to destroy us. The lives of three or four strangers is a cheap price to pay for the preservation of a mind-set, believe me.’

‘No,’ Morrow said. ‘I can’t accept that. I don’t always agree with the Planners. But they aren’t killers.’

‘You think not?’ Uvarov laughed again. ‘The survivalists - your “Planners” - are psychotic. Of course. As I am. And you. We are a fundamentally flawed species. Most of humanity, for most of its history, has been driven by a series of mass psychotic delusions. The labels changed, but the nature of the delusions barely varied . . .’

Uvarov sighed. ‘We built this marvellous ship - we created Paradoxa. We dreamed of saving the species itself. We launched, towards the stars and the future . . .

‘But, unfortunately, we had to take the contents of our heads with us.’

Morrow recalled Perpetuation’s expression, as she had systematically shut out the existence of the forest folk. Maybe, he thought grimly, this was going to be even harder than he’d anticipated.

Lieserl remembered the first time she’d lost contact with the outside human worlds altogether. It had hurt her more than she’d expected.

She'd tested her systems; the telemetry link was still functioning, but input from the far end had simply ceased - quite abruptly, without warning.

Confused, baffled, resentful, she had withdrawn into herself for a while. If the humans who had engineered her, and dumped her into this alien place, had now decided to abandon her - well, so would she them . . .

Then, when she calmed down a little, she tried to figure out *why* the link had been broken.

From the clues provided by Michael Poole's quixotic wormhole flight into the future, Paradoxa had put together a sketchy chronology of man's future history. Lieserl mapped her internal clocks against the Paradoxa chronology.

When she first lost contact, already millennia had passed since her downloading into the Sun.

Earth was occupied, she'd found.

Humans had diffused out beyond the Solar System in their bulky, ponderous slower-than-light GUTships. It had been a time of optimism, of hope, of expansion into an unlimited future.

Then the first extra-Solar intelligence had been encountered, somewhere among the stars: the *Squeem, a* race of group-mind entities with a wide network of trading colonies.

Impossibly rapidly, the Squeem had overwhelmed human military capabilities and occupied Earth. The systematic exploitation of Solar resources - for the benefit of an alien power - was begun.

Sometimes, Lieserl speculated about why the dire warnings of Paradoxa - based on Poole's data - had failed to avert the very catastrophes, like the Squeem occupation, that Paradoxa had predicted. Maybe there was an inevitability to history - maybe it simply wasn't possible to avert the tide of events, no matter how disastrous.

But Lieserl couldn't accept such a fatalistic view.

Probably the simple truth was that - by the time enough centuries had passed for the predictions of Paradoxa to come true - those predictions simply weren't accepted any more. The people who had actually encountered the Squeem must have been pioneers - traders, builders of new worlds. To them, Earth and its environs had been a remote legend. If they'd ever even heard of Paradoxa, it would have been dismissed as a remote

fringe group clinging fanatically to shards of dire prediction from the past, with no greater significance than astrologers or soothsayers.

But, Lieserl realized, Paradoxa's predictions had actually been *right*.

After the Squeem interregnum, contact with her had suddenly been restored.

She remembered how words and images had suddenly come pouring once more through the revived telemetry links. At first she had been terrified by this sudden irruption into her cetacean drifting through the Sun's heart.

Her new capcom - ragged, undernourished, but endlessly enthusiastic - told her that the yoke of the Squeem had been cast off. Humans were free again, able to exploit themselves and their own resources as they saw fit. Not only that, Lieserl learned, the Squeem occupation had left humans with a legacy of high technology - a *hyperdrive*, a faster-than-light means of travelling between the stars.

Hyperdrive technology hadn't originated with the Squeem, it was learned rapidly. They had acquired it from some other species, by fair means or foul; just as humanity had now 'inherited' it.

The true progenitors, of much of the technology in the Galaxy, were known . . . at least from afar.

Xeelee.

The lost human colonies on the nearby stars were contacted and revitalized, and a new, explosive wave of expansion began, powered by the hyperdrive. Humans spread like an infection across the Galaxy, vigorous, optimistic once more.

Lieserl, drifting through her fantasy of Sun-clouds, watched all this from afar, bemused. Contact with her was maintained only fitfully; Lieserl with her wormhole technology was a relic - a bizarre artifact from the past, drifting slowly to some forgotten goal inside the Sun.

In the first few years after the overthrow of the Squeem, humans had prospered - flourished, expanded. But Lieserl grew increasingly depressed as she fast-forwarded through human history. The Universe beyond the Solar System seemed to be a place full of petty, uncreative races endlessly competing for Xeelee scraps. But maybe, she thought sourly, that made it a good arena for mankind.

Then - devastatingly - a war was fought, and lost, with another alien power: the *Qax*.

Earth was occupied again.

There were more birds joining the flock than leaving it, she realized slowly.

The birds joining the cloud came in from random directions. But there was a pattern to the paths of the departing birds: there was a steady flow of the outgoing birds in one direction, in the Sun's equatorial plane, to some unknown destination.

The point was, more birds were arriving than departing. The cloud at the heart of the Sun was *being grown*. The birds were expanding the cloud *deliberately.*

She felt as if she were being dragged along a deductive chain, reluctantly, to a place she didn't want to go. She found, absurdly, that she *liked* the birds; she didn't want to think ill of them.

But she had to consider the possibility.

Was it really true? What if the birds *knew* what they were doing to the Sun? Oh, the precise form of their intelligence - their awareness - didn't matter. They might even be some form of group consciousness, like the Squeem. The key question was their *intent.*

Could the wildest speculations of Paradoxa be, after all, correct? Did the birds represent some form of malevolent intelligence which intended to extinguish the Sun?

Were they smothering the Sun's fusion fire by design?

And if so, why?

Brooding, she sank deeper into the flock, watching, correlating.

They reached the Paradoxa Planners' Temple in Sector 3.

The little party slowed. Arrow Maker and Spinner seemed to have coped well with the sights and sounds of their journey so far, but the glowing, tetrahedral mass of the Temple, looming above them, seemed to have awed them at last. Morrow found it hard to control his own nervousness. After all it was only a few shifts since his own last, painful, personal interview with Milpitas; and now, standing here, he wondered at his own temerity at coming back like this.

Garry Uvarov stirred in his cocoon of stained blanket, his sightless face questing. When he spoke his cheeks, paper-thin, rustled. 'What's going on?

Why have we stopped?'

'We've arrived,' Morrow said. 'This is the Planners' Temple. And—'

Uvarov snorted, cavernously. '*Temple*. Of course they'd call it that. Arrow Maker,' he snapped. 'Tell me what you see.'

Arrow Maker, hesitantly, described the tetrahedral pyramid, its glowing-blue edges, the sheets of glimmering brown-gold stretched across the faces.

Uvarov's head quivered; he seemed to be trying to nod. 'An Interface mockup. These damned survivalists; always so full of themselves. *Temple*.' He twisted his head; Morrow, fascinated, could see the vertebrae of his neck, individually articulating. 'Well? What are we waiting for?'

Morrow, his anxiety and nervousness tightening in his chest, moved forward towards the Temple.

'Milpitas? *Milpitas*?' Uvarov's gaunt face showed some interest. 'I knew a Milpitas: Serena Harvey Gallium Harvey Milpitas . . .'

'My grandmother,' Planner Milpitas said. He sat back in his chair and steepled his long fingers, a familiar gesture that Morrow watched, fascinated. 'One of the original crew. She died a long time ago—'

Uvarov's chair rolled, restlessly, back and forth across Milpitas' soft carpet; Arrow Maker, Morrow and Spinner were forced to crowd to the back of Milpitas' small office to avoid Uvarov. 'I know all that, damn it. I didn't ask for her life history. I said I knew *her*. Glib tongue, she had, like all Martians.'

Milpitas, behind his desk, regarded Uvarov. Morrow conceded with a certain respect that the Planner's composure, his *certainty*, hadn't been ruffled at all by the irruption into his ordered world of these painted savages, this gaunt ancient from the days of the launch itself.

The Planner asked, 'Why have you come here?'

'Because you wouldn't come out to meet *me*,' Uvarov growled. 'You arrogant bastard. I should have—'

'But why,' Milpitas pressed with patient distaste, 'did you wish to meet me at all?' Now he let his cold eyes flicker over the silent forest folk. 'Why not stay in your jungle, climbing trees with your friends here?'

Morrow heard Spinner-of-Rope *growl* under her breath.

Uvarov's nostrils flared, the papery skin stretching. 'I won't be spoken to like that by the likes of you. Who's in charge here?'

'I am,' Milpitas said calmly. 'Now answer my question.'

Garry Uvarov raised his face; in the subdued, sourceless light of Milpitas' office his eye sockets looked infinitely deep. 'You people were always the same.'

Milpitas looked amused. 'What people, exactly?'

'You *survivalists*. Your blessed grandmother and the rest of the crew she fell in with, who thought they were the only ones, the sacred guardians of Paradoxa's mission. Always trying to control everybody else, to fit us all into your damn hierarchies.'

'If you've come all this way to debate social structures, then let's do so,' Milpitas said easily. 'There are reasons for devising hierarchical societies - *purposes* for devising bureaucracies. Did you ever think of that, old man?' He waved a languid hand. 'We're confined here - obviously - within a finite environment. We have limited resources. We've no means of obtaining more resources. So we need control. We must *plan*. We need consistency of behaviour: a regulated society designed to maximize efficiency until the greater goal is reached. And a bureaucracy is the best way of—'

'*Power!* ' Uvarov's voice was a sudden rant.

His head jerked forward on its stem of neck. 'You've built walls around the world, walls around people. Consistency of behaviour my *arse*. We're talking about *power*, Milpitas. That's all. The power to flatten and control - to impose illiteracy - even to remove the right to reproduce. You're damned inhuman; you people always were. And—'

Milpitas laughed; he seemed completely unperturbed. 'How long have you been isolated up there in the trees, Dr Uvarov? How many centuries? And have you cherished this bitterness all that time?'

'You're obsessed with control. You survivalists . . . With your perverted vision of the Paradoxa goal, your exclusive access to the truth.'

Milpitas' laughter faded, and a cold light came into his eyes. 'I know your history, Dr Uvarov. It's familiar enough. Your rejection of AS treatment, your bizarre experiment to *breed* longevity into your people - your *victims*, I should say . . . And you talk to me of obsession. Of *control*. You dare talk to *me* of these things . . .'

In his brief time with the forest folk, Morrow had learned of Uvarov's eugenic ambitions.

Uvarov had rejected AS treatment - and any artificial means - as the way to immortality. To improve the stock, it was necessary to *change the*

species, he argued.

Humans were governed by their genes. They - and every other living thing - were machines, designed by the genes to ensure their own - the genes' - survival. Genes gave their hosts life - and killed them.

Genes which killed their hosts tended to be removed from the gene pool. Thus, a gene which killed young bodies would have no way of being passed on to offspring. But a gene which killed *old* bodies *after* they'd reproduced could survive.

So, perversely, lethal genes in older bodies could propagate.

Uvarov had come to understand that senile decay was simply the outcome of late-acting lethal genes, which could never be selected out of the gene pool by breeding among the young.

After two centuries of flight, Garry Uvarov had determined to improve the stock of humanity the starship was carrying to the future. AS treatment used nanobotic techniques to eliminate ageing effects directly, at the biochemical level, but did not challenge the genes directly.

Even before AS treatment had started to fail him, Uvarov had declared war on the lethal genes which were killing him.

He and his followers had occupied the forest Deck, effectively sealing it off. He sent his people into the forest and told them that they would have a simple life: take nourishment from the forest, make simple tools. AS treatment was abandoned, and within a few years the forest floor and canopy were alive with the voices of children.

Then, Uvarov banned any reproduction before the age of forty.

Uvarov had enforced his rule with iron discipline; stalking through the forest, or ascending, grim-faced, into the canopy, Uvarov and a team of close followers had performed several quick, neat abortions.

After some generations of this, he pushed the conception limit up to forty-five. Then fifty.

The population in the forest dipped, but slowly started to recover. And, gradually, the lethal genes were eliminated from the gene pool.

Over time, some contact - a kind of implicit trade - opened up between the inhabitants of the lower levels and the jungle folk. But there was no incursion from below, no will to break open Deck Zero. And so, with iron determination, Uvarov enforced his huge experiment, century after century.

Arrow Maker and Spinner-of-Rope - face-painted, young-old pygmies were the extraordinary result.

Milpitas listened, apparently bemused, as Uvarov ranted. ‘When I started this work the average lifespan, without AS, was about a hundred. Now we have individuals *over two hundred and fifty years old . . . ’* Spittle looped across his toothless mouth. ‘A thousand AS years isn’t enough. Ten thousand wouldn’t suffice. I’m talking about changing the nature of the *species*, man . . .’

Milpitas laughed at him. ‘Was there ever a more obsessive control of any unfortunate population than that? To deny the benefits of AS to so many generations—’ The Planner shook his bare, scarred head. ‘To waste so much human potential, so many “mute, inglorious Miltons” . . .’

‘I’m transforming the species itself,’ Uvarov hissed. ‘And it’s working, damn you. Arrow Maker, here—’ he cast about vaguely ‘- is eighty years old. *Eighty*. Look at him. By successively breeding out the lethal genes, I’ve —’

‘If your programme was so laudable, then why did you feel it necessary to barricade yourself into the forest Deck?’

Morrow, helpless, felt as if he had wandered into an old, worn-out argument. He remembered his last interview with Milpitas, in which Milpitas had - calmly and consistently - denied the reality of the society above Deck One: a society whose independent existence had been obvious long before Arrow Maker and the others came firing darts down through the opened hatches of the Locks. And now - even when *confronted* with Uvarov and these painted primitives - Milpitas seemed unable to break away from his own restricted world-view.

Uvarov was noisy, of alien appearance, visibly half-insane, and locked inside a partial, incomplete - yet utterly inflexible - mind-set. Milpitas, by contrast, was calm, his manner and speech ordered, controlled. And yet, Morrow reflected uneasily, Milpitas was, in his way, just as rigid in his thinking, just as willing to reject the evidence of his senses.

We’re a frozen society, Morrow thought gloomily. *Intellectually dead. Maybe Uvarov is right about mind-sets. Perhaps we’re all insane, after this long flight. And yet - and yet, if Uvarov is correct about the end of the flight - then perhaps we can’t afford to remain this way much longer.*

With a sense of desperation, he turned to Milpitas. ‘You must listen to him. The situation’s changed, Planner. The ship—’

Milpitas ignored him. He looked weary. ‘I’m growing bored with this. I will ask my question once more. And then you will leave. All of you.

‘Uvarov, why have you come here?’

Uvarov wheeled his chair forward; Morrow heard a dull thud as the chair frame collided softly with Milpitas’ desk. ‘Survivalist,’ he said, ‘*the journey is over*.’

Milpitas frowned. ‘What journey?’

‘The flight of the *Great Northern*. Our odyssey through time, and space, to the end of history.’ His ruined face twisted. ‘I hate to admit it, but our factionalism serves no more purpose. Now, we have to work together - to reach the wormhole Interface, and—’

‘Why,’ Milpitas asked steadily, ‘do you believe the journey is over?’

‘Because *I’ve seen the stars*.’

‘Impossible,’ Milpitas snapped. ‘Your eyes are gone. You’re insane, Uvarov.’

‘My people—’ Uvarov’s voice dried to a croak. Spinner-of-Rope stepped forward, took a wooden bowl of water from a rack within the body of the chair, and allowed a little of the fluid to trickle into Uvarov’s cavern of a mouth.

‘My people are my eyes,’ Uvarov said, gasping. ‘Arrow Maker climbed the tallest tree and studied the stars. I *know*, Milpitas. And I understand.’

Milpitas’ eyes narrowed. ‘You understand nothing.’ He glanced, briefly and dismissively, at Arrow Maker, who returned his look with cool calculation. ‘I’ve no idea what this - person - saw, when he climbed his tree. But I know you’re wrong, Uvarov. We’ve nothing to discuss.’

‘But the stars - don’t you see, Milpitas? *There was no starbow*. The relativistic phase of the flight must be over . . .’

Milpitas smiled thinly. ‘Even now, through the fog that has swamped your intellect, you’ll probably concede that one great strength of the bureaucracies you despise so much is record-keeping.

‘Uvarov, we keep good records. And we *know* that you’re wrong. After all this time there’s some uncertainty, but we know that the thousand-year flight has at least half a century to run.’

Something stirred in Morrow's heart at that. Somehow, he suspected, he'd never quite believed Uvarov's pronouncement - but the authority of a Planner was something else. *Just fifty years . . .*

'You're a damn fool,' Uvarov railed; his chair jerked back and forth, displaying his agitation.

Milpitas said coolly, 'No doubt. But we'll cope with journey's end when it comes. Now I want you out of my office, old man. I have more than enough work to do without—'

Morrow couldn't help but come forward. 'Planner. Is that all you have to say? The first contact between the Decks for hundreds of years—'

'And the last, if I've anything to do with it.' Milpitas raised his face to Morrow; his remodelled flesh was like a sculpture, Morrow thought abstractedly, a thing of cold, hard planes and edges. 'Get them out of here, Morrow. Take them back to their jungle world.'

'Was I wrong to bring them here?'

'Get them out.' Tension showed in Milpitas' voice, and the prominence of the muscles in his neck. '*Get them out*.'

She wondered how she must appear to these photino creatures.

They would find it as difficult to perceive baryonic matter as she, a baryonic creature, found it to see them. Perhaps the birds saw a pale tetrahedron, the faint dark-matter shadow of the exotic matter Interface framework which formed the basis of her being. Perhaps they caught some dim sense of the wormhole itself, the throat of space and time through which she pumped away the heat which would otherwise destroy her.

The old theories had predicted dark-matter particles colliding with the swarming protons of the Solar core, absorbing a little of their energy and so transporting heat out from the fusing heart. This was how, it was thought, dark matter cooled the Sun.

She saw now that these notions had been right in essence, but too crude. The *birds* absorbed Solar heat energy. They fed on interactions with protons in the plasma. Incorporating energy from photino-proton interactions within their structures, the birds grew, and spiralled out from the hotter, denser heart of the Sun, taking the heat energy with them.

The ancient theorists had envisaged a particle-based physical process to extract core heat, and so suppress the fusion processes there. The truth was, the birds *fed* on the Sun's heat.

And, by feeding - like unwise parasites - they would eventually kill their host.

Unwise - unless, of course, that had been the intention all along.

Lieserl had learned about the Qax.

The Qax had originated as clusters of turbulent cells in the seas of a young planet. Because there were so few of them the Qax weren't naturally warlike - individual life was far too precious to them. They were natural traders; the Qax worked with each other like independent corporations, in perfect competition.

They had occupied Earth simply because it was so easy - because they *could.*

The only law governing the squabbling junior races of the Galaxy was, Lieserl realized, the iron rule of economics. The Qax enslaved mankind simply because it was an economically valid proposition.

They had to learn the techniques of oppression from humans themselves. Fortunately for the Qax, human history wasn't short of object lessons.

The wormhole station maintaining contact with Lieserl was abandoned, once again, during the Qax occupation.

Finally the Qax were overthrown. The details hadn't been clear to Lieserl; it was something to do with a man named Jim Bolder, and an unlikely flight in a stolen Xeelee derelict craft, to the site of the Xeelee's greatest project: the Ring . . .

This was the first time Lieserl had heard of the Ring.

After the overthrow, once more humans returned to the Sun, and restored contact with the ageing, increasingly incongruous artifact that contained Lieserl.

This time, Lieserl was shocked by the humans who greeted her.

The Qax, during the occupation, had withdrawn AntiSenescence technology. Death, illness, had returned to the worlds of mankind. It hadn't taken long for toil and disease to erase most of the old immortals - some of whom had still remembered the days before the Squeem, even - and, within a few generations, humans had forgotten much of their past.

The discontinuity in human culture after the Qax was immeasurably greater than that arising from the Squeem occupation. The new people who emerged from the Qax era - and who now peered out of sketchy images at

Lieserl in her cocoon of Solar plasma - seemed alien to her, with their shaven heads and gaunt, fanatical expressions.

Expansion had begun again, but this time fuelled by a hard-edged determination. Never again would humanity be made to serve some alien power. Lieserl in her whale-dream, watching centuries flicker by in fragments of image and speech, saw humans erupt out of their systems once more. A new period began - a period called the *Assimilation.*

During the Assimilation, humans - aggressively and deliberately - absorbed the resources and technologies of other species.

Human culture evolved rapidly in this period. The link with Lieserl was maintained, but with increasingly long interruptions. The motivation of these remote humans seemed to be a brand of hostile curiosity; she saw only calculation in the faces presented to her. She was seen, she suspected, only as another resource to be exploited for the continuing, endless expansion of mankind.

Soon - astonishingly quickly - humans became the dominant of the junior races. Humanity’s growth in power and influence grew exponentially.

At last, only the Xeelee themselves were more potent than mankind . . . And the legend of the Xeelee’s achievements - the construction material, the manipulation of space and time, the Ring itself - grew into a deep-rooted mythology.

Then, for the last time, her wormhole telemetry link was shut down.

Drifting through her endless, unchanging ocean of plasma, she felt a distant twinge of regret - a feeling that soon dispersed into the peaceful, numb silence around her.

Humans had become alien to her. She was better off without them.

The birds must have some lifecycle, she thought; a circle of birth and life and death, much like every baryonic creature. Individual photino birds moved past her too rapidly to follow; but still, she studied them carefully, and was rewarded with glimpses - she thought - of *growth.*

Eventually she saw a bird reproduce.

She could see there was something unusual about this bird, even as it approached. The bird was fat, swollen with proton heat-energy. It seemed somehow more solid - more *real*, to Lieserl’s baryonic senses - than its neighbours.

The bird shuddered - once, twice - its lenticular rim quivering. She almost felt some empathy with the creature; it seemed in agony.

Abruptly - startling Lieserl - the bird shot away from its orbital path. It hovered for a moment - then it hurtled down into the heat-rich core of the Sun once more. Lieserl's processors told her that the bird seemed a little less massive than before.

And it had left something behind.

Lieserl enhanced her senses as far as they would go. The mother-bird had left behind a *copy* of herself - a ghostly copy, rendered in clumps of higher density in the plasma proton-electron mix. It was a three-dimensional image of the mother, *in baryonic matter*. Within fractions of a second the clumps had started to disperse - but not before more photinos had clustered around the complex pattern of baryonic matter, rapidly plating over its internal structure.

The whole process took less than a second. At the end of it, a new photino bird, sleek and small, moved away from the site of its birth; the last traces of the higher-density baryonic material left behind by the mother bird drifted away.

Lieserl ran the image sequence over and over. As a method of reproduction, it was a long way from any Earth-bound form - even cloning. It was more like making a straight copy - an imprint from a three-dimensional mould, mediated by baryonic matter.

The newborn must be an almost exact copy of its parent - more exact than any clone, even. Presumably it carried a copy of its parent's memories - even, perhaps, of its awareness . . .

And, presumably, a copy too of the generation before that - and before that, and . . .

Lieserl smiled. Each photino child must carry within it the soul of all of its grandmothers, a deep tree of awareness reaching right back to the dawn of the species.

And all mediated by baryonic matter, she thought wonderingly. The birds *depended* on the relative transparency of dark and baryonic matter to take their detailed, three-dimensional copies of themselves.

But this meant, she realized, that the photino birds could only breed in places where they could find high densities of baryonic matter. They could only breed in the hearts of stars.

She replayed the birth images, over and over.

There was something graceful, immensely appealing, about the photino birds, and she found herself warming to them. Spiritually she felt much closer to the birds, now, than to the hard-eyed humans of the Assimilation, beyond the Solar ocean.

She hoped her theory - that the birds were deliberately destroying the Sun - was wrong.

The return journey seemed much longer. Morrow felt angry, disappointed, weary. ‘I can’t understand how Milpitas reacted.’ He shook his head. ‘It’s as if he didn’t even *see* you people . . .’

‘Oh, I understand.’ Uvarov twisted his head. ‘*I* understand. We are all too *old*, you see. In a way Milpitas was right about me; after all I share some of these flaws myself.’ Uvarov’s voice, while still distorted by age, was calmer, more rational than at any point during the interview with Milpitas, Morrow thought.

Uvarov went on, ‘But at least I can *recognize* my limitations - the tunnel-vision of my age and condition. And, by recognizing it, deal with it.’

Spinner-of-Rope had been leading the way up the hundred-yard ramp to Deck One. Now, as she neared the top, she slowed. Her hand dropped, seemingly automatically, to her blowpipe and the little sack of feathered darts at her waist.

‘What is it?’ Morrow asked drily. ‘More problems with human body odour?’

She turned, her eyes huge behind her spectacles. Not that. But *something* . . . Something’s wrong.’

Arrow Maker raised his face. ‘I can smell it, too.’

‘Describe,’ Uvarov snapped.

‘Sharp. Smoky. A little like fire, but more intense . . .’

Uvarov grunted. He sounded somehow satisfied. ‘Cordite, probably.’

Arrow Maker looked blank. ‘What?’

They reached the top of the ramp. Hastily, with both forest people bearing their weapons in their hands, they made for the Lock down which Uvarov had been carried.

As they approached the Lock, they slowed, almost as if synchronized. The three of them - Arrow Maker, Morrow and Spinner - stood and stared at the Lock.

Uvarov twisted his face to left and right. ‘Tell me what’s wrong. It’s the Lock, isn’t it?’

‘Yes.’ Morrow stepped forward cautiously. ‘Yes, it’s the Lock.’ The cylinder of metal had been burst open, somewhere near its centre; bits of its fabric, twisted, scorched, none larger than his hand, lay scattered across the Deck surface. There was a stink of smoke and fire - presumably Uvarov’s cordite.

Arrow Maker stood clutching his bow, open-mouthed, impotent. Spinner ran off towards the next Lock, her bare feet padding against the metal floor.

Uvarov nodded. ‘Simple and effective. We should have expected this.’

Morrow bent to pick up a piece of hull metal; but the twisted, scorched fragment was still hot, and he withdrew his fingers hastily.

Spinner came running back. She looked breathless, wide-eyed and very young; she stood close to her father and clutched his arm. ‘The next Lock’s been blown out as well. I think they all have. The Locks are impassable. *We can’t get home*.’

Uvarov whispered, ‘We should check. But I am sure she is right.’

Morrow slammed his fist into his palm. ‘*Why?* I just don’t understand. Why this destruction - this *waste*?’

‘I *told* you why,’ Uvarov said evenly. The existence of the upper level was an unacceptable challenge to the mind-set of Milpitas and the rest of your damn Planners. I doubt if they will have done any damage to the forest Deck itself. Sealing it off - sealing it away from themselves, apparently forever - should do the trick just as well.’

‘But that’s *insane*,’ Morrow protested.

Uvarov hissed, ‘No one ever said it wasn’t. We’re *human beings*. What do you expect?’

Arrow Maker paced about the floor. Morrow became aware, nervously, of the muscles in the back of the little man which flexed, angrily; Maker’s face paint flared. ‘Whether it was intended or not, we’re trapped here. We’re in real danger. Now, what in Lethe are we going to do?’

Morrow’s fear seemed to have been burned out of him by his anger at the foolishness, the wastefulness of the destruction of the Locks. ‘I’ll help you. I’ll not abandon you. I’ll take you to my home - I live alone; you can

hide there. Later, perhaps we can find some way to open up a Lock again, and—'

Arrow Maker looked grateful; but before he could speak Uvarov wheeled forward.

'*No*. We won't be going back to the forest.'

Arrow Maker said, 'But, Uvarov—'

'Nothing's changed.' Uvarov turned his blind face from side to side. 'Don't you see that? Arrow Maker, you saw the stars yourself. *The ship's journey is over*. And *we* have to go on.'

Spinner clutched at her father's arm. 'Go on? Where?'

'Regardless of the reaction of these damn fool survivalists, we will continue. Down through these Decks, and onwards . . . On to the Interface itself.'

Arrow Maker, Spinner and Morrow exchanged stricken glances.

Uvarov tilted back his head, exposing his bony throat. 'We've travelled across five million years, Arrow Maker,' he whispered. '*Five million years* . . . Now it's time to go home.'

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11

She shivered. Suddenly, she felt oddly cold. *Cold? No. Come on, Lieserl, think.*

Sometimes her Virtual-human illusory form was a hindrance; it caused her to anthropomorphize genuine experiences.

Something had *happened* to her just now; somehow her environment had changed. How?

There it came again - that deep, inner stab of illusory cold.

She looked down at herself.

A ghost-form - a photino bird - emerged from her Virtual stomach, and flew away on its orbit around the Sun. Another came through her legs; still more through her arms and chest - and at last, one bird flew through her head, the place where *she* resided. Her cold feeling was a reaction to the slivers of energy the birds took away from her as they passed through.

Before, the photino birds had avoided her; presumably residually aware of her, they'd adjusted their trajectories to sweep around her. Now, though, they seemed to be doing quite the opposite. They seemed to be aiming at her, veering from their paths so that they deliberately passed through her.

She felt like screaming - struggling, beating away these creatures with her fists.

Much good that will do. She forced herself to remain still, to observe, to wait.

Behind her the birds seemed to be gathering into a new formation: a cone with herself at the apex, a cone into which they streamed.

Could they damage me? Kill me, even?

Well, could they? Dark matter could interact with baryonic to a limited extent. If their density, around her, grew high enough - if the rate of interaction between the birds and the particles which comprised her grew high enough - then, she realized, the birds could do *anything.*

And there wasn't a damn thing she could do about it; embedded in this mush of plasma, she could never get away from them in time.

She felt as if a hard, needle rain were sleeting through her. It was uncomfortable - tingling - but not truly painful, she realized slowly.

Maybe they didn't mean to destroy her, she wondered drowsily. Maybe - maybe they were trying to *understand* her . . .

She held out her arms and submitted herself to inspection by the photino birds.

They formed into a rough column - Arrow Maker leading, then Uvarov, followed by Morrow and Spinner-of-Rope, with Spinner occasionally boosting Uvarov's chair.

Morrow stepped over the ramp's shallow lip and began the gentle, hundred-yard descent back into the comparative brightness and warmth of Deck Two.

'Listen to me,' Garry Uvarov rasped. 'We're at the top of the lifedome. We have to get to the bottom of the dome, about a mile below us. Then we'll need to find a pod and traverse half the length of the *Northern*'s spine, towards the drive unit; and that's where we'll find the Interface. Got that?'

Most of this was unimaginable to Morrow. He tried to concentrate on the part he understood. 'What do you mean by the bottom of the lifedome? Deck Four?'

A bark of laughter from Uvarov. 'No; I mean the loading bay. Below Deck Fifteen.'

Morrow felt something cringe within him. *I'm too old for this* . . . 'But, Uvarov, there is *nothing* below Deck Four—'

'Don't be so damn stupid, man.'

' . . . I mean, nothing inhabited. Even Deck Four is just used as a mine.' He tried to imagine descending *below* the gloomy, cavernous Deck in which he'd spent so much of his working life. It might be airless down there. And it would certainly be *dark*. And—

There was a whisper of air past his ear, a clatter as something hit the metal of the ramp behind him.

Arrow Maker froze, reaching for his bow instantly. Spinner hauled Uvarov's chair to a halt, and the old doctor stared around with his sightless eyes.

'What was that?' Uvarov snapped.

Morrow took a couple of steps back up the ramp and searched the surface. Soon he spied the glint of metal. He bent to pick up the little artifact.

It was a piton, he realized - a simple design he'd turned out hundreds of times himself, in the workshops of Deck Four, for the trade with the forest

folk. Perhaps Arrow Maker and Spinner had pitons just like this in their kit even now.

But this piton seemed to have been sharpened; its point gleamed with rough, planed surfaces . . .

There was another whisper of air.

Spinner cried out. She clutched her left arm and bent forward, tumbling slowly to the Deck.

Arrow Maker bent over her. ‘Spinner? *Spinner?* ’

Spinner held her left arm stiff against her body, and blood was seeping out through the fingers she’d clamped over her flesh.

Arrow Maker prised his daughter’s hand away from her arm. Blood trickled down her bare flesh, from a neat, clean-looking puncture; a metal hook protruded from the centre of the puncture. Spinner showed no pain, or fear; her expression was empty, perhaps with a trace of dull surprise showing in the eyes behind her spectacles.

Without hesitation Maker grabbed the hook, spread his fingers around its base across Spinner’s flesh, and pulled.

The device slid out neatly. Spinner murmured, her face pale beneath its lurid paint.

Arrow Maker held up the blood-stained artifact. It was another piton. ‘Someone’s shooting at us,’ he said evenly.

‘Shooting?’ Uvarov turned his blind face towards Morrow. ‘What’s this, paper-pusher? Is Paradoxa arming you all now?’

Morrow took a few steps down the ramp, further into the light of Deck Two, and peered down.

Four people were climbing the ramp towards him: two women and two men, in drab, startlingly ordinary work uniforms. They looked scared, even bewildered; but their advance was steady and measured. They were pointing devices at his chest. He squinted to see the machines: strips of gleaming metal, bent into curves by lengths of cable.

‘I don’t believe it,’ he whispered. ‘Cross-bows. They’re carrying *cross-bows*.’

The weapons were obviously of scavenged interior partition material. They must have been constructed in the Deck Four workshops - perhaps mere yards from the spot where Morrow had whiled away decades making

climbing rings, ratchets, spectacle frames and bits of cutlery for forest folk he'd never expected to meet.

One of the four assailants, a woman, lifted her bow and began to adjust it, increasing its tension by working a small lever. She drew a piton from her tunic pocket and fitted it into a slot on top of the bow. She raised the bow and sighted along it, at his chest.

Morrow watched, fascinated. He thought he recognized this woman. *Doesn't she work in a hydroponics processor in Segment 2*? And—

A compact mass crashed into his legs. His body was flung to the hard, ridged surface of the ramp, his cheek colliding with the floor with astonishing force.

Another sigh of air over his head; again he heard the clatter of a sharpened piton hitting metal.

Arrow Maker's hand was on his back, pinning him against the ridged ramp surface. 'You'd better damn well wake up, if you want to stay alive,' the forest man hissed. 'Come on. Back up the ramp. Spinner, help Uvarov.'

Spinner-of-Rope, blood still coating her lower arm, clambered up behind Uvarov's chair and began to haul it backwards up the ramp.

Morrow sat up cautiously. His cheek ached, his left side - where he'd landed - was sore, and the ramp felt astonishingly hard beneath his legs. The sparks of pain were like fragments of a sensory explosion. He realized slowly that he hadn't been in a fight - or any kind of violent physical situation - since he'd been a young man.

Arrow Maker's hand grabbed at his collar and hauled him backwards, flat against the ramp. 'Keep *down*, damn it. Watch me. Do what I do.'

Morrow, with an effort, turned on his belly; the ramp ridges dug painfully into the soft flesh over his hip.

Arrow Maker worked rapidly up the ramp. He was small, compact, determined; his bare limbs squirmed across the metal like independent animals. Beyond him, Spinner had already pulled Uvarov out of the line of sight, into the darkness of Deck One.

Morrow tried to copy Arrow Maker's motion, but his clothes snagged on rough edges on the ramp, and the coarse surface rubbed at his palms.

Another piton whispered over his head.

He clambered to a crawling position and - ignoring the agony of kneecaps rolling over ridges in the surface - he scurried up the few yards of

the ramp and over its lip.

Arrow Maker tore a strip from Uvarov's blanket and briskly wrapped it around his daughter's wounded arm. Maker said, 'They're coming up the ramp. They'll be here in less than a minute. Which way, Morrow?'

Morrow rolled onto his backside and sat with his legs splayed. He couldn't quite believe what had happened to him. '*Weapons*,' he said. 'How could they have made them so quickly? And—'

From the gloom of Deck One he heard Uvarov's barked laughter. 'Are you really so naïve?'

Arrow Maker finished his makeshift bandage. 'Morrow. Which way do we go?'

'The elevator shafts,' Uvarov croaked from the darkness. They'll be covering all the ramps. The shafts are our only chance. And the shafts cut right through the Decks, all the way to the base of the dome . . .'

'But the shafts are disused,' Morrow said, frowning. The shafts had been shut down after the abandonment of the lower Decks, centuries before.

Uvarov grimaced. 'Then we'll have to climb, won't we?'

Morrow could hear the slow, cautious footsteps of their four assailants as they came up the ramp.

The Decks weren't a very big world, and he'd been alive for a long time. He must *know* these people.

And they were coming to *kill* him. If someone else had had the misfortune to be on Deck One when Maker and Spinner first stuck their heads through the hatch, then maybe he, Morrow, would now be in this hunting party, with cross-bows and bolts of scavenged hull-metal . . .

A shadow fell across him. He looked up into the eyes of the woman who worked in the Segment 2 hydroponics. She held a gleaming cross-bow bolt pointed at his face.

There was a whoosh of air.

The woman raised her hand to her face, the palm meeting her cheek with a dull clap. She fell backwards and rolled a few paces down the ramp. The cross-bow dropped from her loosening fingers and clattered to the Deck.

Beyond the fallen woman Morrow caught a brief impression of the other three Deck folk scrambling back down the ramp.

Spinner-of-Rope lowered her blowpipe; beneath her spectacles, her lips were trembling.

‘It’s all right, Spinner-of-Rope,’ Maker said urgently. ‘You did the right thing.’ ‘Morrow,’ Uvarov said. ‘Show them the way.’ Morrow pushed himself to his feet and stumbled away from the ramp.

The elevator shaft was a cylinder of metal ten yards across; it rose from floor to ceiling, a hundred yards above them.

Spinner-of-Rope, blood soaking through her dark bandage, leaned against the shaft. She looked tired, scared, subdued. *She really is just a kid*, Morrow thought.

But she said defiantly, ‘You Undermen aren’t used to fighting, are you? Maybe those four weren’t expecting us to fight back. So they’ll be scared. Cautious. It will slow them down—’

‘But not stop them,’ Arrow Maker murmured. He was running his hand over the surface of the shaft, probing at small indentations in its surface. ‘So we haven’t much time . . . Morrow, how do we get into - *Oh*.’

In response to Arrow Maker’s random jabs, a panel slid backwards and sideways. A round-edged doorway into the shaft was opened up, about as tall as Morrow and towering over the forest folk.

Within the shaft, there was only darkness.

Arrow Maker stuck his head inside the shaft, and peered up and down its length. ‘There are rungs on the inner surface. It’s like a ladder. Good. It will be easy to climb. And—’

Spinner touched his arm. ‘What about Uvarov?’

Arrow Maker turned to the old doctor, his face creasing with concern.

Morrow looked with dismay at the gaping shaft. ‘We’ll never be able to carry that chair, not down a *ladder*—’

‘Then carry *me*.’ Uvarov’s ruined, crumpled face was deep in shadow as he lifted his head to them. ‘Forget the chair, damn it. Carry *me*.’

Morrow heard footsteps, echoing from the bare walls of Deck One. ‘There’s no time,’ he said to Arrow Maker. ‘We have to leave him. We can’t —’

Maker looked up at him, his face drawn and haughty beneath its gaudy paint. Then he turned away. ‘Spinner, give me a hand. Get his blanket off.’

The girl took hold of the top of the black blanket and gently drew it back. Uvarov’s body was revealed: wasted, angularly bony, dressed in a

silvery coverall through which Morrow could clearly see the bulge of ribs and pelvis. There were lumps under Uvarov's tunic: perhaps colostomy bags or similar medical aids. Although he must have been as tall as Morrow, Uvarov's body looked as if it massed no more than a child's. One hand rested on Uvarov's lap, swaying through a pendular tremble with a period of a second or so, and the other was wrapped around a simple joystick which - Morrow presumed controlled the chair.

Arrow Maker took Uvarov's wrist and gently pulled his hand away from the joystick; the hand stayed curled, like a claw. Then Maker leaned forward, tucked his head into Uvarov's chest, and straightened up, lifting Uvarov neatly out of his chair and settling him over Maker's shoulder. As Arrow Maker stood there Uvarov's slippered feet dangled against the floor, with his knees almost bent.

Uvarov submitted to all this passively, without comment or complaint; Morrow, watching them, had the feeling that Arrow Maker was accustomed to handling Uvarov like this - perhaps he served the old doctor as some kind of basic nurse.

As he studied the tough little man, almost obscured by his dangling human load, Morrow felt a pang of shame.

Spinner-of-Rope picked up Uvarov's blanket and slung it over her shoulder. 'Let's go,' she said anxiously.

'You lead,' Arrow Maker said.

Spinner took hold of the frame of the open hatch and vaulted neatly into the shaft. She twisted, grabbed onto the rungs beneath the doorframe, and clambered down out of sight.

'Now you, Morrow,' Arrow Maker hissed.

Morrow put his hands, now sweating profusely, on the door frame. Damn it, he was five hundred years older than Spinner. And even when he'd been fifteen he'd never been *lithe* . . .

'*Move!* '

He raised one leg and hoisted it over the lip of the door frame. The frame dug into his crotch. He tried to bring his second leg over - and almost lost his grip in the process. He clung to the frame with both hands, feeling as if the entire surface of his skin was drenched in cold sweat.

He tried again, more slowly, and this time managed to get both legs over. For a moment he sat there, feet dangling over a drop whose depth was

hidden by darkness.

If the shaft was open all the way to the bottom of the lifedome, there was a mile's drop below him.

He thought, briefly, of climbing back out of the shaft. Could he really face this? He could try surrendering, after all . . . But, oddly, it was the thought of the consequent shame in the face of Arrow Maker and Spinner made that option impossible.

He reached out and down, cautiously, with his right foot. It seemed a long way to the first rung, but at last he caught it with his heel. The rung felt fat and reassuringly solid. He got both feet onto the rung and straightened up. Then, still being minutely careful, he turned around, letting the soles of his feet swivel over the metal rung.

He bent his knees and reached out for the next rung. It was about eighteen inches below the first. Once he'd gone down two or three rungs and he started to settle into a routine, with both hands and feet fixed to the rungs, the going got easier—

Until he suddenly became aware that he was climbing down *into the dark.*

He couldn't see a damn thing, not even the metal shaft surface before his face, or the whiteness of his own hands on the rungs.

He stopped dead and looked up, suddenly desperate even for the dim light of Deck One. Instantly he felt warm, bare feet trampling over the backs of his hands on the rungs, and the clumsy pressure of Arrow Maker's legs on his shoulders and head; something clattered against his back - Uvarov's feet, presumably.

Spinner's voice drifted up from the shaft. 'What's going on?'

'What in Lethe are you doing?' Arrow Maker hissed.

'I'm sorry. It was dark. I—'

'Morrow, your friends are going to reach the shaft any moment—'

Something metallic rattled from the walls of the shaft, the resounding bounces coming further apart as it fell.

Uvarov's voice sounded from the region of Maker's upper legs. 'Correction,' he said dryly. 'They *have* reached the shaft . . .'

Desperately, urgently, Morrow began to climb down once more.

Lieserl lay back in the glowing hydrogen-helium mix with arms outstretched and eyes closed, and felt fusion-product photons dance slowly

around her. Following their minutes-long orbits around the core of the Sun, the long, lenticular forms of the photino birds flowed past Lieserl. She let the swarming birds cushion her as she sank into the choking heart of the Sun, floating as if in a dream.

And, at last, she came to a region, deep inside the Sun, in which no new photons were produced.

She and Scholes had been right, all those years ago. The core had gone out.

The persistent leeching-out of energy from the Sun's hydrogen-fusing core, by the flocks of photino birds, had at last become untenable. A long time ago - probably before Lieserl's birth - the temperature of the core had dropped so far that the fusion of hydrogen into helium flickered out, died.

Now, its heart already stilled, the Sun was working through its megayear death throes. Despite the slow, continuing migration of the last photons outward from the stilled fusion processes, there was little radiation pressure, here at the heart of the Sun, to balance the core's tendency to collapse under gravity. So the extinguished core fell in on itself further, seeking a new equilibrium, its temperature rising as its mass compressed.

Lieserl knew that in the heart of every star of the Sun's mass, these processes would at last take place - even without the intervention of an agent like the dark matter photino birds. Once the core hydrogen was exhausted, hydrogen fusion processes would die there, and this final subsidence, of a helium-soaked core, would begin.

The difference was, the Sun's core was still replete with unburned hydrogen; fusion processes had died, not because of hydrogen exhaustion, but because of the theft of energy by untiring flocks of photino birds.

And, of course, the Sun should have enjoyed ten billion years of Main Sequence life before reaching this dire state. The photino birds had allowed Sol mere *millions* of years, before forcing this decrepitude.

Around him there was the noise of his own breathing, the soft, ringing sound of his hands and feet on the metal rungs, and - further away, and distorted by echo - the subtle noises of the forest folk as they climbed. There was an all-pervading smell of metal, overlaid by a tang of staleness.

In the darkness Morrow had no way of judging time, and only the growing ache in his muscles to measure the distance he'd travelled. But slowly - to his surprise - his vision began to return, adapting to the gloom.

There was actually quite a lot of light in here: there was the open portal at the top, on Deck One, and fine seams in the walls of the shaft shone like arrows of grey silver in the darkness. He could see the dim, foreshortened silhouettes of Arrow Maker and Spinner, above and below him; they climbed with a limber grace, like animals. And in the shaft itself he could see the shadow of cables, dangling, useless.

As he worked his muscles seemed to lose some of their stiffness. He was, he realized with surprise, *enjoying* this . . .

‘Stop.’ Spinner’s voice, softened by echo, came up to him.

He halted, clinging to the rungs, and hissed a warning up to Arrow Maker.

‘What is it?’

‘We’re in trouble,’ Spinner said softly.

‘No, we’re not,’ Maker said. ‘We’re descending more quickly than those thugs with the cross-bows. They didn’t follow us down here. So they have to follow the ramps; we’re going straight down.’

Spinner sighed. ‘Damn it, Maker, I wish you’d listen to me. Look *down*. See?’

Arrow Maker straightened his arms and leaned out over the shaft; Uvarov, passive, dangled against his frame. ‘*Oh*.’

Morrow twisted his head to see.

There was a rough framework crossing the shaft, some distance below them. He felt a sudden surge of hope; was his climb nearly done? ‘Is that the base of the shaft?’

He saw the flash of Spinner’s teeth in the gloom as she grinned up at her father. ‘No,’ she said. ‘No, not exactly.’

Maker said, ‘How far would you say we’ve descended, Spinner? Five hundred yards? . . . Barely a third of the way to the base of the lifedome, if Uvarov’s dimensions are correct.’

Five hundred yards . . . They were scarcely past Deck Four, Morrow realized: beyond the scuffed walls of the shaft here were the shops to which he strolled to work every shift. Or *had*, before he’d become a hunted criminal.

The transient enjoyment leached out of him; a trembling ache descended on his legs and upper arms. There was still *twice as far to go* as he’d travelled already . . .

‘Do you understand their amusement, Morrow?’ Uvarov asked acidly, his voice obscured by his limp posture. ‘The shaft has been *blocked*.’

‘Maker,’ Spinner whispered. ‘I can see someone moving down there.’

Morrow hooked his arm across a rung and looked down more carefully.

The platform blocking the shaft was quite a crude thing, of beams and plates lashed quickly together, roughly welded. A shadow crawled cautiously across the platform; there was a flare of laser-weld light, a small shower of sparks.

Spinner is right. Someone is moving down there - building the thing even as we watch. Deliberately blocking off the shaft, to stop us. How many times had *he* used laser tools like that? Thousands? It could easily have been *him* down there.

. . . In fact, he realized suddenly, he ought to know who that worker was.

He leaned further out and stared, squinting, trying to make out more of the stocky figure. He saw a sleeveless tunic, brawny arms and torso, surprisingly wasted legs . . .

‘Constancy-of-Purpose. *Constancy-of-Purpose*.’

At the sound of Morrow’s voice, floating out of the gloom above her, Constancy-of-Purpose started. She dropped her laser weld, which died immediately, and scrambled backwards across the platform she’d been building. Morrow saw how she held her wounded arm away from her body, stiffly.

Morrow clambered briskly down the ladder, shouldering Spinner aside. He reached the platform and jumped down onto it. ‘Constancy-of-Purpose,’ he whispered. ‘It’s me. Morrow.’

Constancy-of-Purpose got to her feet, warily. She pushed goggles up from her eyes. Morrow saw sweat gleam from her wide shoulders; where the goggles had been, dirt ringed her eyes. ‘What in Lethe—’

‘It’s all right. You don’t have to be afraid.’

‘Morrow. What’s going on?’

‘You have to let us through.’

‘Us?’ Constancy-of-Purpose glanced up into the darkness nervously.

‘I have the forest folk with me. You remember.’

‘Of course I damn well remember.’ Constancy-of-Purpose reflexively rubbed her stiff arm and backed towards the wall of the shaft. ‘That little

criminal *shot* me.'

'Yes, but - well, she was scared. Listen to me - you must let us through. Past this barrier.'

Constancy-of-Purpose looked at him, bafflement and suspicion evident in her face. 'Why? What are you doing?'

'Don't you know?' Actually, Morrow reflected, Constancy-of-Purpose probably *didn't* know . . . The Planners had most likely sent out instructions to block off all the old shafts, without explanation. All to trap *him*, and these forest folk. *I was just lucky to find Constancy-of-Purpose . . .*

'I'm not stupid, Morrow,' Constancy-of-Purpose said. 'I don't know what's going on, quite. But the Planners are obviously trying to trap these tree people. And I'm not surprised. They're *killers*. And if you're helping them—'

'Listen. The *Planners* are the killers. Or at least, they're trying to turn the likes of us into killers.' Morrow described the cross-bows and sharpened pitons, weapons created from horribly mundane objects.

As he talked, Morrow's mind seemed to race, making leaps of induction. He remembered how Uvarov had taunted him for naïveté. Was it *really* possible that Paradoxa had machined these weapons so quickly, in response to the arrival of the forest folk?

No, he decided. There hadn't been time. Paradoxa must have weapons *stockpiled.*

But Constancy-of-Purpose was shaking her head. 'I don't believe you,' she said.

'Believe it,' Morrow snapped. 'Spinner - the tree girl - got shot in the arm. By a *piton*, for Lethe's sake. Do you want me to show you the wound?'

Constancy-of-Purpose looked up uncertainly. 'I . . . no.'

'Constancy-of-Purpose, if you let us past we'll be home free. The Planners surely won't pursue us below Deck Four; this is the last point they can stop us . . . But if you keep us here, *you'll kill us*, just as surely as if you wielded the cross-bow yourself . . .'

Morrow tried to keep control of his own ragged breathing, not to let Constancy-of-Purpose be aware of his mounting fear.

' . . . All right.' Suddenly Constancy-of-Purpose, symbolically, moved aside. 'Hurry. I'll say I didn't see you.'

Morrow reached out his hand, then let it drop. ‘Thank you.’

Constancy-of-Purpose frowned. ‘Just go, man.’ She bent and, with the strength of her uninjured arm, began to prise up a partially welded plate, making a narrow gateway through the blocking platform.

After a moment’s hesitation the forest folk scrambled down the ladder and dropped to the platform, lightly. Constancy-of-Purpose glared at Spinner-of-Rope. Spinner returned her stare, thoughtfully stroking the blowpipe at her waist.

‘*Go on*,’ Morrow told Spinner. ‘Through that plate.’

The forest folk hurried across the platform, their bare feet padding, and Spinner began to work her way through the hole.

Now Constancy-of-Purpose stared at Uvarov, still slung over Maker’s shoulder.

‘Is he dead?’

‘Who? The old man? Not quite, but as near as damn it, I suppose . . . If I come by this way again, I’ll explain.’

‘But you *won’t* be coming back, will you?’ Constancy-of-Purpose’s blunt face was serious.

‘ . . . No. I don’t suppose I will.’

Constancy-of-Purpose backed away, her hands upraised. ‘You’re crazy. Maybe I should have stopped you after all.’

Arrow Maker, with Uvarov, was already through the platform, and Morrow sat down on the edge of the hole. He looked up. ‘Wish me luck.’

But Constancy-of-Purpose had already gone, out of the shaft and back to the mundane world of the Decks: to Morrow’s old life.

Morrow eased himself through the platform.

Before long Morrow’s shoulders and legs stiffened up again and began to hurt, seriously, and he was forced to take longer and longer breaks. The base of the shaft - illuminated by a ring of open ports - was a remote island of light that climbed towards him with infinite, cruel slowness.

Now they were far below the deepest inhabited level. Beyond the shaft’s cold walls, he knew, there was only darkness, stale air, abandoned homes. The cold seemed to pervade the shaft; he felt small, fragile, isolated.

They found ledges on which it was possible to rest - to stretch out, and even doze a little. Arrow Maker laid Uvarov down flat on the hard metal surfaces, and he showed Morrow how to massage his own muscles to stop

them seizing up. Spinner produced food - dried fruit and meat - from a pouch at her waist; Morrow tried to eat but his stomach was a knot.

He counted the Decks as they passed them. *Ten* . . . *Eleven* . . . *Twelve* . . . The Decks above Four - all the world he had known, really - were an increasingly distant bubble of light and warmth, far above him.

And yet, if this journey was strange and disturbing for him, how much more difficult must it be for the forest folk? At least Morrow was *used* to metal walls. Spinner and her father had grown up with trees - animals, birds - living things. They must wonder if they would ever see their home again.

At last, though, the time came when he could count the last twenty rungs; then the last dozen; and then—

He staggered a few paces away from the ladder and laid himself out against a metal floor, spread-eagled. Here at the base of the shaft, a series of open, illuminated hatchways pierced the walls. ‘By Lethe’s waters,’ he said. ‘What a day. I never thought I’d be so happy simply not to be in danger of *falling*.’

Arrow Maker lifted Uvarov from his shoulder and gently rested him, like a doll, against the wall of the elevator shaft. Morrow saw how Uvarov’s hand continued its endless, pendular tremble, and his mouth opened and closed with soft, obscene sounds. ‘Are we there? Are we down?’

Maker flexed his unburdened shoulder, swinging his arm around. ‘Yes,’ he said. ‘Yes, we’re there . . .’ He approached one of the hatchways, but slowed nervously as he approached the light.

Morrow got to his feet. He tried to remember how alien all this must be to these people; perhaps it was time for him to take charge. Picking a hatchway at random he walked confidently out of the shaft, and into bright, sourceless light.

The brightness, after the gloom of the shaft, was dazzling and huge. For a moment he stood there, by the entrance to the shaft, his hands shading his watering eyes.

He was in a bright, clean chamber. It must have been a mile wide and a fifth of a mile deep. The underside of the lowest Deck was a ceiling far above him, a tangle of pipes and cables, dark with age. The chamber was quite empty, although there were some dark, anonymous devices - *cargo handlers*? - stored in slings from the walls and upper bulkhead. Morrow felt

himself quail; the emptiness of this huge enclosed space seemed to bear down on him. And below him—

He looked down.

The floor was transparent. Below his feet, there were stars.

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12

After an unknowable, dreamlike interval, Lieserl became aware of a vague sense of discomfort - not *pain*, exactly, but a non-localized ache that permeated her body.

She sighed. If the discomfort wasn't specific to any part of her Virtual body, there had to be something wrong with the autonomic systems that maintained her awareness - the basic refrigeration systems embedded in the wormhole throat, or maybe the shielded processor banks within which her consciousness resided.

Reluctantly she called up diagnostics from her central systems. *Damn* . . .

There *had* been a change, she realized quickly. But the problem wasn't actually with her own systems. The change was in the external environment. There was a much greater flux of photons, from the Solar material, into her wormhole Interface. Her refrigeration units could cope with this greater influx of energy, but they'd had to adjust their working to do it - and that autonomic adjustment was what she had registered as a vague discomfort.

The increased photon flux puzzled her. Why should it be so? She ran some brief, brisk studies of the Solar environment. The remnant photons still diffused out on their million-year random walks towards the photosphere. Could it be that the core-killing action of the birds, their continual leaching away of core energy, was having some effect on the photon flux?

She looked for, and found, a structure to the increased flux. The flux strength was strongest, by far, in the direction of the orbits of the photino birds. That correlation couldn't be a coincidence, surely; somehow the birds *were* influencing the flux rates.

And - she learned - the increased flux was quite localized. It didn't show up more than a few miles from her own position.

Understanding came slowly, almost painfully.

The photon flood followed *her* around.

She forced herself to accept the fact that the photino birds were doing this *deliberately*. They were diverting the random walks of photons to flood her with the damn things.

For a while, fear touched her heart. Were the birds trying to kill this unwanted alien in the midst of their flocks - perhaps by seeking to overload her refrigeration system?

If so, there wasn't much she could do about it. She didn't have any help to call on, and no real way to escape. For a long time she limped after the birds in their endless circling of the core, monitoring the photon flux and trying to control her fear, her sense of imprisonment and panic.

But the flux remained steady - increased, but easily tolerated by her onboard systems. And the birds showed no sign of hostile intent to her; they continued to swirl around her in gaudy streams, or else they gathered behind her in their huge, neat, cone-shaped formations. They made no attempt to shield their young from her, or to protect their fragile-looking interior structures.

And, slowly, she began to understand.

This deliberate diversion of the photon flux into her wasn't a threat, or an attempt to destroy her. Perhaps they thought she was injured, or even dying. They must be able to perceive radiant energy disappearing into her wormhole gullet. The birds were *helping* her - trying to supply her with more of what must seem to them to be her prerequisites for life.

The gift was useless, of course - in fact, given the increased strain on her refrigeration systems, worse than useless. *But*, she thought wryly, *it's the thought that counts.*

The birds were trying to *feed* her.

Feeling strangely warmed, she accepted the gift of the photino birds with good grace.

As time wore on, she watched the Sun's death proceed, with increasing pace. She felt an obscure, dark thrill as the huge physical processes unravelled around her.

The core, still plagued by the photino bird flocks, contracted and continued to heat up. At last, a temperature of tens of millions of degrees was reached in the layers of hydrogen *surrounding* the cankered core. A shell of fusing hydrogen ignited, *outside* the core, and began to burn its way out of the heart of the Sun. At first Lieserl wondered if the photino birds would try to quench this new shell of energy, as they had the hydrogen core. But they swept through the fusing shell, ignoring its brilliance. Helium ash

was deposited by the shell onto the dead core; the core continued to grow in mass, collapsing still further under its own weight.

The heat energy emitted by the shell, with that of the inert, collapsing core, was greater than that which had been emitted by the *original* fusing core.

The Sun couldn't sustain the increased heat output of its new heart. In an astonishingly short period it was forced to expand - to become *giant.*

Louise Ye Armonk stood on the forecastle deck of the *Great Britain*, peering down at the southern pole of Triton.

The *Britain* sailed through space half a mile above the satellite's thin, gleaming cap of nitrogen ice; steam trailed through space, impossibly, from the ship's single funnel. The ice cap curved beneath the prow of the ship as seamlessly as some huge eggshell. The southern hemisphere of Neptune's largest moon was just entering its forty-year summer, and the ice cap was receding; when Louise tilted back her head she could see thin, high cirrus clouds of nitrogen ice streaming northwards on winds of evaporated pole material.

She walked across the deck, past the ship's bell suspended in its elaborate cradle. The huge, misty bulk of Neptune was reflected in the bell's gleaming surface, and Louise ran her hand over the cool contours of the shaped metal, making it rock gently; the multiple, amorphous images of Neptune slid gracefully across the metal.

From here the Sun was a bright star, a remote point of light; and the blue light of Neptune, eerily Earthlike, bathed the lines of the old ship, making her seem ethereal, not quite substantial - paradoxical, Louise reflected, since the *Britain* was actually the only real artifact in her sensorium at present.

As the *Britain* neared the ragged edge of Triton's ice cap, a geyser blew, almost directly in front of the floating ship. Dark substrate material laced with nitrogen ice plumed into the air, rising ten miles from the plain; as it reached the thin, high altitude wind the plume turned through a right angle and streamed across the face of Triton. Louise walked to the lip of the forecastle deck and followed the line of the plume back down to the surface of the moon, where she could just see the fine crater in the ice at the plume's base. The geyser was caused by the action of the sun's heat on pockets of gas trapped beneath thin crusts of ice. Shards of ice were

sprinkled around the site of the eruption, and some splinters still cartwheeled through the thin nitrogen atmosphere, slowly returning to the surface under the languid pull of Triton's gravity.

This was one of her favourite Virtual dioramas, although it was actually one of the least familiar. The capability of her processors to generate these dioramas was huge, but not infinite; she'd deliberately kept the Neptune diorama in reserve, rationing its use over the unchanging centuries, to try to conserve its appeal.

It wasn't hard to analyse why this particular Virtual scene appealed to her so much. The landscape of this remote moon was extraordinary and unfamiliar, and surprisingly full of change, fuelled by the energies of distant Sol; and Neptune's blue mass, with its traceries of nitrogen cirrus, was sufficiently Earthlike to prompt deep, almost buried feelings of nostalgia in her - and yet different enough that the references to Earth were almost subliminal, obscure enough that she was not tempted to descend into morbid longing. And—

Pixels swirled before her suddenly, a thousand self-orbiting blocks of light. Surprised, she almost stumbled; she gripped onto the rail at the edge of the deck for support.

The pixels coalesced with a soundless concussion into the image of Mark Wu. The projection was poor: the Virtual floated a few inches above the deck, and cast no shadow in Neptune's pale light.

'Lethe's waters,' Louise said, 'don't do that. You startled me.'

'I'm sorry,' Mark said. Even his voice was coarse and blocky, Louise noticed. 'It was urgent. I had to interrupt you. I—'

'*And* this projection's lousy. What's the matter with you?' Louise felt her mind slide comfortably into one of its familiar sets - what Mark called her *analytical griping*. She'd be able to while away a good chunk of the empty day interrogating the processor, picking over details of this representation of Mark. 'You're even floating above the deck, damn it. I wouldn't be surprised if you start losing the illusion of solidity next. And —'

'Louise. I said it was *urgent.*'

She found her voice trailing off, her concentration dissolving.

Mark stepped towards her, and his face enhanced visibly, fleshing out and gaining violet-blue tones of Neptunian light. The processors projecting

Mark were obviously trying to help her through this interaction. But the rest of his body remained little more than a three-dimensional sketch - a sign that he was diverting most of the available processing power to another priority. ‘Louise,’ Mark said, his voice soft but insistent. ‘Something’s happened. Something’s changed.’

‘Changed?’ *Nothing’s changed - not significantly - for nearly a thousand years . . .*

Mark smiled. ‘Your mouth is open.’

She swallowed. ‘I’m sorry. I think you’re going to have to give me a bit of time with this.’

‘I’m going to turn off the diorama.’

She looked up with unreasonable panic at the remote face of Neptune. ‘Why?’

‘Something’s happened, Louise—’

‘You said that already.’

‘*The lifedome*.’ His eyes were fixed on hers.

She felt dreamy, light, almost unconcerned, and she wondered if the nanobots working within her body were feeding her some subtle tranquillizer. ‘Tell me.’

‘Someone is trying to use one of the ports in the lifedome base.’ Mark’s eyes were deep, probing. ‘Do you understand, Louise? Can you hear what I’m saying?’

‘Of course I can,’ she snapped.

After five centuries without contact, someone was leaving the lifedome. She tried to grasp the reality of Mark’s statement, to envisage it. *Someone was coming.*

‘Turn off the projection,’ she told Mark wearily. ‘I’m ready.’

Neptune collapsed suddenly, like a burst balloon; Triton shrivelled into a billion dwindling pixels, and the light of Sol flickered out. For a moment there was only the *Great Britain*, the undeniable reality of Brunel’s old ship hard and incongruent at the centre of this infinity of greyness, of the absence of form; Mark stood before her on the battered deck, his too-real face fixed on hers, reassuring.

Then the Universe returned.

Arrow Maker was falling out of the world.

He sat in the craft - this *pod,* as Uvarov had called it - with his bow and quiver piled neatly on the seat next to him. His bare legs dangled over his chair's smooth lip. There was a simple control console, just within his reach before him.

The pod's walls were transparent, making the cylindrical hull almost invisible. The pod was *nothing,* less sheltering than an insubstantial dream; the four seats, with Maker and his incongruous, futile bow, seemed to be dropping unsupported through the air.

Uvarov had pointed out the pod to him. Maker had barely been able to *see* it - a box of translucent strangeness in a world of strangeness.

Uvarov had told him to get into the pod. Maker, without thought, it seemed, had obeyed.

Through the floor of the pod he could see the port approaching. It was a rectangle set in the base of the lifedome, bleak and unadorned, bordered by a line of pale brilliance. He could still see stars through the lifedome base, but he realized now that it wasn't perfectly transparent. It returned some reflection of the sourceless inner light of the lifedome, making it a genuine floor across the world. Perhaps a layer of dust had collected over the base during the long centuries, spoiling its pristine clarity.

By contrast there was nothing within the expanding frame of the port - *nothing*, not even Uvarov's stars. The frame was rising towards him, preparing to swallow him and this foolish craft like an opening mouth.

The port was a doorway to emptiness.

He felt his bowels loosen. Fear was constantly with him, constantly threatening to erupt from his control . . .

Spinner's voice sounded small, distorted, emanating from the air. 'Maker? Can you hear me? Are you all right?'

He cried out and gripped the edges of his seat. His throat was so tight with tension he couldn't speak. He closed his eyes, shutting out the huge, bizarre unrealities around him, and tried to get some control. He lifted his hands to his waist; he touched the liana rope Spinner had wrapped around him as a good luck talisman, just before his departure.

'Maker? Arrow Maker?'

' . . . Spinner,' he gasped. 'I can hear you. Are you all right?'

She laughed, and just for a moment he could visualize her round, sardonic face, the way she would push her spectacles up her short nose.

‘That’s hardly the point, is it? The question is, are *you* all right?’

‘Yes.’ He opened his eyes, cautiously. The invisible engines of this bubble-pod hummed, almost silently, and below him the exit from the lifedome was a floor of grey emptiness, expanding towards him with exquisite slowness. ‘Yes, I’m all right. You startled me a bit, that’s all.’

‘I’m not surprised.’ The voice of the tall, dry man from the Decks - Morrow - was rendered even more flat than usual by the distortions of the hidden communications devices. ‘Maybe we should have spent more time showing you what to expect.’

‘Is there anything you want?’

‘Yes, Spinner-of-Rope.’ Arrow Maker felt small, fragile, isolated, like a child in a vehicle made for adults. All around him there was a sharp, *empty* smell: of plastic and metal, an absence of life. He longed for the rich humidity of the jungle. ‘I wish we could go home,’ he told his daughter.

‘For Life’s sake, stop this babbling.’ The voice of Garry Uvarov was like a rattle of bone against glass. ‘Arrow Maker,’ Uvarov said. ‘Where are you?’

Maker hesitated. The lifedome exit was huge beneath him now - he was so close to it, in fact, that its corners and edges were foreshortened; the semitransparent surface of the lifedome turned into a rim of distant, star-spangled carpet around this immense cavity. He felt himself cringe. He reached out blindly for his bow and clutched it to his chest; it was a small token of normality in this world of strangeness. ‘I can’t be more than a dozen feet from the exit. And I—’

The lip of the port, brightly lit, slid upwards around the pod, now; Arrow Maker felt as if he were being immersed in some bottomless pool.

When she understood the birds were trying to feed her, she tried to pick out individuals among the huge flocks. She told herself she wanted to study the birds: learn more of their life-cycle, mediated as it was by baryonic matter, and perhaps even try to become *empathetic* with the birds, to try to comprehend their individual and racial goals.

But making friends with photino birds - forming contact with individuals in anything like a conventional human sense - simply wasn’t a possibility for her, it emerged. They were so nearly alike - after all, she reflected, given their simple reproductive strategy the birds were very nearly clones of each other - that it was all but impossible for her to tell

them apart. And, on their brief orbits around the Sun, they flashed past her so quickly. She certainly couldn't identify them closely enough to follow individuals through consecutive orbits past her.

So - though she was surrounded by the birds, and bathed in their strange, luminous generosity - Lieserl remained, still, fundamentally alone.

She felt intense disappointment at this. At first she told herself that this was a symptom of her limited understanding of the birds: Lieserl, as the frustrated scientist.

But this was just a rationalization, she knew.

She forced herself to be honest. What some part of her really wanted, deep down, was for the photino birds to *accept* her - if not as one of their own, then as a tolerable alien in their midst.

When she first diagnosed this about herself, she felt humiliated. For the first time she was glad there was nobody observing her, no latter-day equivalent of Kevan Scholes studying her telemetry and deducing her mental state. Was she really so pathetic, so internally weak, that she needed to cling to crumbs of friendship - even from these dark-matter creatures, whose alienness from her was so fundamental that it made the differences between humans and Qax look like close kinship?

Was she *really* so lonely?

The subsequent embarrassment and fit of self-loathing took a long time to fade.

Individual contact with the birds would be meaningless anyway. Since they were so alike, their behaviour as individuals so undifferentiated, racial goals seemed far more important to the birds than individual goals. Personality was subsumed beneath the purpose of the species to a far greater extent than it ever had been with humans - even at the time of the Assimilation, she thought, when opposition to the Xeelee had emerged as a clear racial goal for humanity.

She watched the birds breed, endlessly, the swarms of clumsy young sweeping on uncontrolled elliptical orbits around the Sun's core in pursuit of their parents.

The birds' cloning mode of reproduction seemed to shape the course of their lives.

At first the cloning seemed restrictive - even claustrophobic. Racial goals, downloaded directly from the mother's awareness into the young,

overrode any individual ambitions. The young were robots, she decided, programmed from birth to fulfil the objectives of the species.

But then, so had *she* been programmed by her species - and so, to some extent, had every human who had ever lived, she thought. It was all a question of degree.

And anyway, would it really be so terrible, to be a photino bird?

With species-objective programming must come an immense fund of wisdom. The youngest photino bird would come to awareness with an expanded set of racial memories and drivers surely beyond the comprehension of any human.

Phillida had boasted that she - Lieserl - would become, with her close and accurate control of her memories and the functions of her mind, the most *conscious* human who had ever lived. Maybe that was once true. But, even at the height of her powers, Lieserl's degree of awareness was surely a mere candle compared to the immense conscious power available to the humblest of the photino birds.

And perhaps, she thought wistfully, these birds *were* all components of some extended group-mind - perhaps to analyse the consciousness of any individual bird would be as meaningless as to study the awareness of a single component in her own processing banks, or one neurone in the brain of a conventional human.

Perhaps.

But that didn't seem important to Lieserl, compared to the sense of *belonging* the birds must share.

Lieser1, the eternal outsider, watched the birds sweep past her in their lively, co-ordinated flights. She felt awe - and something else: *envy.*

She pulled away from the shrinking core of the Sun, out through the searing hydrogen-fusing shell, and soared up into the envelope - the bloated, gaseous mantle that the outer forty per cent of giant-Sun's mass had become. The envelope was a universe of thin gas - so thin, she imagined, that if she tried hard enough she could *see* out through these teeming layers, to the stars beyond (or what was left of them).

The Sun was a red giant. It had become a pocket cosmos in itself, with its own star - the hydrogen-fusion shell around the dead core - blazing at the centre of this clogged, gas-filled space. But the outer layers, the mantle, had become so swollen that they utterly dwarfed the core. In fact, the

dimensions of the Sun were like those of an atom, she realized, with the shrunken, blazing core occupying the same proportion of space within its mantle-cloud as did the nucleus of an atom within its cloud of electrons.

The photino birds clustered around the Sun's shrinking heart, sipping relentlessly at its energy store. She was outside the bulk of the flock now - although some outriders still swept past her, on their way into the flock from the Universe outside. With a new feeling of detachment, she started to experience a deepening sense of disquiet at the activities of the birds. From this perspective, the birds seemed like carrion, she thought, or tiny, malevolent parasites.

Restless, disturbed, Lieserl moved through the huge envelope. There was *structure* here, even in this immense volume, she saw. The photosphere of the new red giant - its huge, glowing surface - had actually become less opaque to radiation; its temperature had fallen so far that electrons had recombined with nuclei, increasing the transparency of the surface layers. So - even though its surface temperature had dropped - the Sun was actually radiating more energy, overall, than it had done before its swelling.

To fuel this increased luminosity, immense convection cycles had started - cells which spanned millions of miles, and which would persist for hundreds of days. The convection cycles dug deep into the mantle to haul energy out of the core regions to be pumped out to space - and along with the energy dredging, Lieserl saw, the convection was changing the composition of the Sun, polluting the outer regions with nucleosynthesis products like nitrogen-14, dug out of the core regions.

Coherent maser radiation flashed along the flanks of the convection cells, startling her with its intensity.

As she travelled through the thin gas she felt a faint buffeting, a rocking of the exotic-matter framework of her Interface.

There was turbulence here. The convection process wasn't perfectly efficient, and energy, struggling to escape from the inner regions, was forced to dissipate itself in a complex, space-filling array of turbulent cells. The Sun's magnetic field was affected by this turbulence. She saw how the flux was pushed out of the interior of the cells, to form fine sheets across the cells' surfaces - but the sheets were unstable, and they burst like sheets of soap film, leaving ropes of flux at the intersections of the turbulence cells. Lieserl swam through a million-mile mesh of the magnetic flux ropes.

It was bizarre to think that - if she wished - she could travel out as far as the old orbital radius of Earth, without ever leaving the substance of the Sun.

Lieserl knew - with remote, abstract sadness - that the inner planets, out as far as Earth, must have been consumed in the Sun’s cooling, red-tinged mantle. She remembered her brief, golden childhood: the sparkling beaches of the Aegean, the sharp, enticing scent of the sea, the feel of sand between her babyish toes. Perhaps humans, somewhere, were still enjoying such experiences.

But Earth, the only world *she* had known, was gone forever.

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13

‘**A**rrow Maker, *tell me what you see*. Can you see the stars?’ Arrow Maker looked down, through the pod hull. ‘I don’t understand.’

Uvarov’s voice, disembodied, became ragged; Arrow Maker imagined the old man thrashing feebly beneath his blanket. ‘Can you see Sol? You should be able to, by now. Arrow Maker - *is Earth there?* Is—’

‘No.’

‘Maker—’

‘*No*.’

Arrow Maker shouted the last word, and Uvarov subsided.

The illuminated lip of the port had passed right over the pod now; it was visible to Maker as a frame of light above his head. The outer darkness had enclosed the pod . . . No, he was thinking about this in the wrong way. The darkness was the Universe; as if in some obscene, mechanical birth, the pod had been *expelled* from the lifedome into the dark.

The base of the lifedome hung over him like a huge belly of glass and metal, receding slowly, its curvature becoming apparent. And through it - distorted, rendered misty by the base material - he made out the light-filled interior of the dome. He could see bits of detail: elevator shafts from the decks above, control consoles like the one at which he’d left Spinner, Morrow and Uvarov - why, if he had eyes sharp enough, he could probably look up now and see the soles of his daughter’s feet.

Suddenly the reality of it hit him. He had travelled *outside the lifedome*. He was beyond its protective hull - perhaps the first human to have ventured outside in half a millennium - and now he was suspended in the emptiness which made up most of the forbidding, lifeless Universe.

‘*Arrow Maker*. Talk to us.’

Arrow Maker laughed, his voice shrill in his own ears. ‘I’m suspended in a glass bubble, surrounded by emptiness. I can see the lifedome. It’s like —’

‘Like what?’ Morrow’s voice, sounding intrigued.

‘Like a box of light. Quite - beautiful. But very fragile-looking . . .’

Uvarov cut in, ‘Oh, give me strength. *What else, Arrow Maker*?’

Arrow Maker twisted his head, to left and right.

To the right of the pod, an immense pillar of sculpted metal swept through space. It was huge, quite dwarfing the pod, like the trunk of some bizarre artificial tree. It merged seamlessly with the lifedome, and it was encrusted with cups, ribs and flowers of shaped metal.

Maker described this.

‘The spine,’ Uvarov said impatiently. ‘You’re travelling parallel to the spine of the GUTship. Yes, yes; just as I told you. Arrow Maker, can you see the Interface? The wormhole—’

Arrow Maker leaned forward and peered down, past the seats and stanchions, through the pod’s base. This *spine* descended for a great distance, its encrustation of parasitic forms dwindling with perspective, until the spine narrowed to a mere irregular line. The whole form was no less than three miles long, Uvarov had told him.

Beyond the spine’s end was a sheet of light which hid half the sky. The light was eggshell-blue and softly textured; it was like a vast, inverted flower petal, ribbed with lines of stronger, paler hue. As Arrow Maker watched he could see a slow evolution in the patterns of light, with the paler lines waving softly, coalescing and splitting, like hair in a breeze. The light cast blue highlights, rich and varying, from the structures along the spine.

He was looking at the GUTdrive: the light came from the primeval energies, Uvarov had told him, which had hurled the ship and all its cargo through space and time for a thousand years.

Silhouetted against the sheet of creation light, just below the base of the spine, was a dark, irregular mass, too distant for Arrow Maker to resolve: that was the tethered ice asteroid, which still - after all these years - patiently gave up its flesh to serve as reaction mass for the great craft. And —

‘Uvarov. *The Interface*. I see it.’

There, halfway down the spine’s gleaming length, was a tetrahedral structure: edged in glowing blue, tethered to the spine by what looked like hoops of gold.

‘Good.’ He heard a tremulous relief in Uvarov’s voice. ‘*Good*. Now, Arrow Maker - look around the sky, and describe the stars you see.’

Arrow Maker stared, beyond the ship. The spine, the Interface, were suspended in darkness.

Uvarov's speech became rushed, almost slurred. 'Why, we might be able to place our position - and the *date* - by the constellations. If I can find the old catalogues; those damn survivalists in the Decks must have retained them. And—'

'Uvarov.' Arrow Maker tried to inject strength into his voice 'Listen to me. There's something wrong.'

'There can't be. I—'

'There are no constellations. *There are no stars*.' Beyond the ship there was only emptiness; it was as if the great ship, with its flaring drive and teeming lifedome, was the only object in the Universe . . .

No, that wasn't quite true. He stared to left and right, scanning the equator of the grey-black sky around him; there seemed to be *something* there - a ribbon of light, too faint to make out colour.

He described this to Uvarov.

'The starbow.' Uvarov's voice sounded much weaker, now. 'But that's impossible. If there's a starbow we must be travelling, still, at relativistic velocities. But we can't be.' The old, dead voice cracked. 'Maker, you've seen the stars yourself.'

'No.' Arrow Maker tried to make his voice gentle. 'Uvarov, all I've ever seen were points of light in a skydome . . . Maybe they weren't stars at all.'

If, he thought ruefully, *the stars ever existed at all.*

He stared at the mass of the spine as it slid upwards past him, suddenly relishing its immensity, its detail. He was *glad* there were no stars. If this ship was all that existed, anywhere in the Universe, then it would be enough for him. He could spend a lifetime exploring the worlds contained within its lifedome, and there would always be the forest to return to. And—

Light filled the cabin: a storm of it, multicoloured cubes and spheres which swarmed around him, dazzling him. Then, as suddenly as they had appeared, the cubes hurtled together and coalesced.

There was a man sitting beside Arrow Maker, *inside the pod*, dressed in a grey-silver tunic and trousers. His hands were in his lap, folded calmly, and through his belly and thighs Arrow Maker could see the quiver of arrows he'd left on the chair - *he could actually see the quiver*, through the flesh of the man.

The man smiled. 'My name's Mark - Mark Bassett Friar Armonk Wu. Don't be frightened.'

Arrow Maker screamed.

Lieserl swam with the photino birds through the heart of the bloated Sun. The photino birds appeared to relish Sol's new incarnation. Plasma oscillations caused energy to flood out of the core, in neutrino-antineutrino pairs, and the birds swooped around the core, drinking in this glow of new radiance.

The matter in the inert, collapsing core had become so compressed it was *degenerate*, its density so high that the intermolecular forces that governed its behaviour as a gas had broken down. Now, the gravitational infall was balanced by the pressure of electrons themselves: the mysterious rule of quantum mechanics called the Pauli Exclusion Principle, which ensures that no two electrons can share the same energy level.

But this new state of equilibrium couldn't last for long, Lieserl realized. The shell of fusing hydrogen around the core continued to burn its way outward, raining helium ash down on the core; and so the core continued to grow, to heat up.

Now that the inner planets were gone, she felt utterly isolated.

Why, even the stone-faced bureaucrats of the Assimilation period had been contact of a sort. She'd found it immensely valuable to be able to share impressions with somebody else - somebody outside her own sensorium. In fact she wondered if it were possible for any human being to remain sane, given a long enough period without communication.

But then again, she thought wryly, she *wasn't* a human being . . .

Into Lethe with that. She closed her eyes and stretched. She took a slow, careful inventory of her Virtual body-image. She wriggled her fingers, relishing the detailed feel of sliding tendons and stretching skin; she arched her back and felt the muscles at the front of her thighs pull taut; she worked her feet forward and back, as if she were training for some celestial ballet, and focused on the slow, smooth working of her ankles and toes.

She was human, all right, and she was determined to stay that way - even despite the way she'd been treated by humans themselves, in her brief, but still vivid, corporeal life. What had she been but a freak, an experiment that had ultimately been abandoned?

She didn't owe *people* anything, she told herself.

Maybe.

But again that buried urge to *communicate* all this gripped her: she felt she had to tell someone about all this, to warn them.

But those feelings weren't logical, she knew. Since the wormhole telemetry link had been shut down she had no way to communicate anyway. And while she had dreamed, here inside the imperilled heart of the Sun, five million years had worn away in the Solar System outside. For all she knew there might be no humans left alive, anywhere, to hear whatever she might have to say.

. . . Still, she *itched* to talk.

Again, maser radiation shone out of a convection cell and sparkled over her, bright and coherent.

Intrigued, she followed the path of one of the convection cells as it swept out of the heart of the Sun, bearing its freight of heat energy; she tried to trace the source of the maser light.

The radiation, she found, was coming from a thin trace of silicon monoxide in the mantle gas. Collisions between particles were *pumping* the gas with energy, she saw - leaving the monoxide molecules in an unstable, excited state, rotating rapidly.

A photon of just the right frequency, impacting a pumped molecule, could cause the molecule to tip out of its unstable state. The molecule shed energy and emitted another photon of the same frequency. So the result was two photons, where one had been before . . . And the two photons stimulated two more atoms, resulting in four photons . . . A chain reaction followed, growing geometrically, with a flood of photons from the stimulated silicon monoxide molecules - all at the same microwave frequency, and all coherent - with the same phase.

Lieserl knew that to get significant maser effects, pumped molecules had to be arranged in a line of sight, to get a long path of coherence. The convection cells, with their huge, multimillion-mile journeys to the surface and back, provided just such pathways. Maser radiation cascaded up and down the long flanks of the cells, spearing into and out of the helium core.

The maser radiation could even escape from the Sun altogether, she saw. The convection founts grazed the surface, at their most extreme points; maser energy was blasted out, tangential to the surface of the swollen Sun, forming tiny, precise beacons of coherent light.

And the maser beacons were, she realized with a growing excitement, very, very distinctive.

Excited, she swept back and forth through the huge convection cells. It wasn't difficult, she found, to disrupt the form of the coherent silicon monoxide maser beams; she imposed structure on the beams' polarization, phasing and coherent lengths.

She started with simple signals: sequences of prime numbers, straightforward binary arrays of symbols. She could keep that up almost indefinitely; thanks to the time it took for the coherent radiation to reach their firing points at the surface, it was sufficient for her to return to the convection cells every few days to re-initiate her sequence of signals. She could trace echoes of her signals, in fact, persisting even in the downfalling sides of the cells.

Then, as her confidence grew, she began to impose meaningful information content on her simple signal structure. With binary representations of images in two and three dimensions, and with data provided in every human language she knew, she began to relate the story of what had happened to her, here in the heart of the Sun - and of what the photino birds were doing to mankind's star.

Feverishly she worked at the maser signals, while the final death of the Sun unravelled.

In the stern galley of the *Great Britain*, Louise sat before her data desks. The little pod from the lifedome showed up as a block of pixels sliding past a schematic of the *Northern.*

Over the radio link she heard screams.

'Oh, for Lethe's sake, Mark, don't scare him *completely* out of his mind.'

Mark sounded hurt. 'I'm doing my best.'

Louise felt too tired, too used up, to cope with this sudden flood of events.

She tried, sometimes, to remember how it had been to be young. Or even, not quite so *old*. It might have been different if Mark had survived, of course: his AS system had imploded after four centuries, not long after he and Louise had moved out of the lifedome and into the *Britain*. Maybe if Mark *had* lived, if she'd spent all these years with another person - *not alone* - she wouldn't have ended up feeling so damn *stale.*

She comforted herself with the thought that, whatever was going on today, the *Northern*'s immense journey was nearing its end, now. Another few decades, when she had shepherded the wormhole Interface and motley inhabitants of the lifedome - those who'd survived among those battling, swarming masses - through all these dreadful years, she would be able to let go at last. Maybe *she* would implode then, she thought, like some dried-up husk.

She called up a projection of its trajectory. 'Well, it's not heading for the *Britain*,' she told Virtual-Mark. 'It's moving past us . . .'

A new voice came crackling out of her data desk now, 'Arrow Maker. *Arrow Maker*. Listen to me. You must reach the Interface. Don't let them stop you . . .'

To Louise, this was a voice from the dead past. It was distorted by age, almost reduced to a caricature, echoing as if centuries were empty rooms.

She localized the source of the transmission - a desk in the base of the lifedome, near the pod hangars - and she threw open a two-way link. 'Uvarov? Garry Uvarov?'

The voice fell silent, abruptly.

She heard Mark, in the pod, saying, 'Now just take it easy. I know this is strange for you, but I'm not going to hurt you.' A pause. 'I couldn't if I tried. I'll tell you a secret: *I'm not real*. See? My hand is passing right through your arm, and—'

More screams, even shriller than before.

Oh, Mark . . .

'Come on, Uvarov,' she said. 'I know it's you. I still recognize that damn Moon accent. Speak to me.'

'Oh, Lethe, Louise,' Mark reported, 'he's gone crazy. He's grabbed the stick: he's accelerating - right towards the Interface.'

Mark was right, she saw; the craft's speed had increased, and it was clearly heading to where the wormhole Interface was cradled in its web of superconducting hoops, bound magnetically to the structure of the GUTship.

She punched in quick queries. Less than two minutes remained before the pod reached the Interface.

'Uvarov, listen to me,' she said urgently. 'You must respond. Please.' While she spoke, her hands flew over the desks; she ordered her processors

to find some way to take control of the pod. She cursed herself, silently, for her carelessness. She'd had centuries, literally, to find ways of immobilizing the lifedome pods. But she'd never imagined this scenario, some crazy savage with a painted face taking a pod into the Interface while they were still relativistic.

Well, she damn well *should* have imagined it.

'Uvarov. You must respond. We're still in flight.' She tried to imagine the old eugenicist's condition, extrapolating wildly from the few words she'd heard him speak. 'Uvarov, can you hear me? You have to stop him - the man in the pod, this *Arrow Maker*. He'll destroy himself . . .' *And*, she thought sourly, *maybe the whole damn ship as well*. 'You know as well as I do that the Interface can't be used during the flight. The kinetic energy difference between our Interface and the one back in the past will make the wormhole unstable. If your Arrow Maker flies that pod in there, he'll wreck the wormhole.'

'You're lying,' Uvarov rasped. 'The journey's over. We've seen the stars.'

'Uvarov, listen to me. *We're still relativistic*.' She turned to peer out of the galley's small windows. The *Britain* was suspended beneath the belly of the lifedome, so that the dome was huge and brilliant above her; the spine pierced space a few hundred yards away. And, all around the spine, the starbow - the ring of starlight aberrated by their motion - gleamed dully, infinitely far away.

With a small corner of her mind, she longed to shut this out, to erect some Virtual illusion to hide in.

'I can see the damn starbow, Uvarov. With my own eyes, right now. We're decelerating, but we're still relativistic. We have decades of this journey ahead of us yet . . .' Was it possible Uvarov had *forgotten*?

In the background she could hear Mark's voice patiently pleading with the primitive in the pod; her desks showed her endless representations of the processors' failed attempts to override the pod's autonomous systems, and the astonishingly rapid convergence of the pod with the Interface.

He pushed the crude control as far forward as it would go. The pod hurtled past the spine. He felt mesmerized, bound up in the extraordinary events around him, beyond any remnants of fear.

Once again a frame of light embraced the pod, expanding, enclosing, like a swallowing mouth. This time, the frame was triangular, not rectangular; it was rimmed by blue light, not silver-white. And it contained - not a bleak, charcoal-grey emptiness - but a pool of golden light, elusive, shimmering.

There were *stars* in that pool. How ironic it was, thought Arrow Maker, that perhaps here at last he would find the stars of which old, mad Uvarov had dreamed.

The ghost-man - *Mark* - was still speaking to him, urgently; but the ghost was crumbling into cubes of light, which scattered in the air, shrinking and melting.

Arrow Maker barely noticed.

Suddenly, she thought she understood.

She spoke rapidly. ‘Uvarov, listen. Please. The skydome above the forest *isn’t truly transparent*. It’s semisentient - it’s designed to deconvolve the distorting effects of the flight, to project an illusion of stars, of normal sky. Garry, can you hear me? The skydome shows a *reconstruction* of the sky - and I think you’ve *forgotten* that it’s a reconstruction. The forest people *can’t* have seen the stars.’ She tried to find words to reach this man, whom she’d first known a thousand years ago. ‘I’m sorry, Garry. I truly am. But you *must* make him turn back.’

‘Louise.’ Mark’s voice was clipped, urgent. ‘Arrow Maker is not responding. I’m starting to break up; we’re already within the exoticity field of the Interface, and—’

Uvarov screamed, ‘The Interface, Arrow Maker! You’ll travel back across five million years - tell them we’re here, that *we made it*. Arrow Maker!’

Now there were other voices on Uvarov’s link: a man, a girl ‘Maker! Maker! Come back . . .’

Mark’s voice faded out.

On Louise’s desk, the gleaming, toylike images, of pod and Interface, converged.

The blue-white framework was all around him now, its glow flooding the cabin of the pod with shadowless light and banishing the spine and lifedome, as if they were insubstantial. The pod shuddered, its framework glowing blue-violet.

The voice of Spinner-of-Rope, his daughter, became indistinct.

He called to her: ‘Look after your sister, Spinner-of-Rope.’

He couldn’t make out her reply. Soon there was only the tone of her dear voice, pleading, pressing.

A tunnel - lined by sheets of light, shimmering, impossibly long - opened out before him.

He sank into the golden pool, and even Spinner’s voice was lost.

Louise massaged her temples and closed her eyes. There was nothing more she could do. Not now.

She remembered how it had become clear - early in the flight, after a shockingly short time - that the *Northern*’s fragile artificial society was going to collapse. Mark had helped her understand the cramped social dynamics going on inside the lifedome: the dome contained a closed system, he said, with positive socio-feedback mechanisms leading to wild instabilities, and . . .

But understanding hadn’t helped them cope with the collapse.

The first rebellion had been inspired by one of Louise’s closest allies: Uvarov, who had led his eugenics-inspired withdrawal to the forest. After that Paradoxa - or rather, the Planners who had turned the original Paradoxa philosophy into a bizarre ideology - had subverted whatever authority Louise had retained and imposed its will on the remaining inhabitants of the lifedome.

Louise and Mark had withdrawn to this place: to the converted, secure *Great Britain*. From here Louise had isolated the starship’s essential systems - life support and control - from the inhabitants of the dome. During the long centuries since - long after Mark’s death, long after the occupants of the dome had forgotten her existence - she had watched over the swarming masses within the lifedome: regulating their air, ensuring the balance of the small, enclosed ecologies was maintained, guiding the ship to its final destination.

What the people did to each other, what they believed, was beyond her control. Perhaps it always had been. All she strove to do was to keep as many as possible of them alive.

But now, if the wormhole was lost, it had all been for nothing. *Nothing.*

The kinetic energy of the pod shattered the spacetime flaw that was the wormhole. The portal behind it imploded at lightspeed, and gravititional

waves and exotic particles pulsed around the craft.

Arrow Maker felt the air thicken in his lungs, cold settling over his bare skin. The pod jolted, and he was almost thrown out of his seat; calmly he unwrapped Spinner's liana-rope from his waist and tied it around his torso and the seat, binding himself securely.

He held his hands before his face. He saw frost, glistening on his skin; his breath steamed in the air before him.

The pod's fragile hull cracked and starred; one by one the craft's systems - its heating, lights, air - collapsed under the hammer-blows of this impossible motion.

Through a transient network of wormholes which collapsed behind him in storms of heavy particles and gravity waves, Arrow Maker fell across past and future, the light of collapsing spacetime playing over his shivering flesh.

Light flared from the Interface. It gushed from every face of the tetrahedron like some liquid, bathing the *Northern* in violet fire.

It was like a small sun.

The starship shuddered. The steady glow of the GUTdrive flickered - actually flickered, for the first time in centuries. The *Britain*, old and fragile in its cradle, rocked back and forth, and Louise heard a distant clatter of falling objects, the incongruously domestic sound of sliding furniture.

All over the lifedome, lights flickered and died.

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14

H*e was the last man.*

He was beyond time and space. The great quantum functions which encompassed the Universe slid past him like a vast, turbulent river, and his eyes were filled with the grey light against which all phenomena are shadows.

Time wore away, unmarked.

And then—

There was a box, drifting in space, tetrahedral, clear-walled.

From around an impossible corner a human walked into the box. He was dressed in treated animal skins. He was gaunt, encrusted in filth, his skin ravaged by frost.

He stared out at the stars, astonished.

Michael Poole's extended awareness stirred.

Something had changed. History had resumed.

PART III
EVENT : SOL

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15

Louise Ye Armonk stood on the pod's short ladder. Below her, the ice of Callisto was dark, full of mysterious depths in the smoky Jovian ring-light.

She felt a starburst of wonder. For the first time in a thousand subjective years she was going to walk on the surface of a world.

She stepped forward.

Her feet settled to the ice with a faint crunch. Her boots left well-defined, ribbed prints in the fine frost which coated Callsto's surface.

The thick environment suit felt heavy, despite the easiness of Callisto's thirteen-per-cent-gee gravity. Louise lifted her hands and pressed her palms together; she was barely able to feel her hands within the clumsy gloves. The suit was a thousand years old. Trapped inside this thing she felt deadened, aged, as if she were forced to work within some glutinous fluid.

She looked around, peering through her murky faceplate, squinting to make out detail through the plate's degraded image-enhancement. As her sense of wonder faded, she felt irritation grow; she knew it was weak of her, but, damn it, she *missed* the crystal clarity of her Virtual dioramas.

Jupiter and Sol were both below the little moon's infinite-flat, icy horizon: but Jupiter's new rings arced spectacularly out of the horizon and across the sky. The ring system's far edge occluded the stars, razor-sharp, and the ice and rock particles of the rings sparkled milky crimson in the cool, distant sunlight.

The rings were like a huge artifact, she thought. Here, a mote on a plain of ice, she felt dwarfed to insignificance.

She tipped back her head and looked at the stars.

It had already been a year since the *Northern*'s speed had dropped sufficiently for the last relativistic effects to bleach from the Universe, a year in which they'd slowly coasted in from the outer System to Jupiter. The *Northern* had been in orbit around the Jovian moon for several days now, and Morrow had been working down here for most of that time. Preliminary scans from the *Northern* had told them that there was something buried inside the freshly frozen Callisto ice - something *anomalous*. Morrow, with his team of 'bots, was trying to find out what that was.

But this was Louise's own first trip down to the surface. And the experience of being immersed in a *sky* - a genuine, spread-out, distortion-free starry sky - was an unnerving novelty to Louise, after so long being surrounded by the washed-out starbow of near-lightspeed.

But what a sky it was - a dull, empty canopy of velvet, peppered by the corpses of stars: wizened, cooling dwarfs, the bloated hulks of giants - some huge enough to show a disc, even at interstellar distances - and, here and there, the traceries of debris, handfuls of spider-web thrown across the sky, which marked the sites of supernovas.

There was a grunt, and a diffuse shadow fell across the ice.

Louise turned. Spinner-of-Rope was making her slow, cautious way out of the pod after her. Spinner's small body, made bulky by the suit, was silhouetted against the pod lights. She placed each footstep deliberately on the surface, and she held her arms out straight.

Louise grinned at Spinner. 'You look ridiculous.'

'Oh, thanks,' Spinner said sourly. Through the dully reflective faceplate Louise could see the glint of Spinner's spectacles, the glare of face paint, the white of Spinner's teeth. Spinner said, 'I just don't want to go slip-sliding across this ice-ball of a moon.'

Louise looked down and scuffed the surface with her toe, leaving deep scratches. Within the ice she could see defects: planes, threads and star-shaped knots, imperfections left by the freezing process. 'This is ice, but it's not exactly smooth.'

Spinner waddled up to her and sniffed; the noise was like a scratch in Louise's earpiece. 'Maybe,' Spinner said. 'But it's a lot smoother than it used to be.'

'. . . Yes.'

'Look,' Spinner said, pointing. 'Here comes the *Northern*.'

Louise turned and peered up, dutifully. The *Northern*, trailing through its hour-long orbit, was a thousand miles above the surface. Subvocally she ordered her faceplate to enhance the image. The ship became a remote matchstick, bright red in the light of Sol; it looked impossibly fragile, like some immense toy, she thought. The asteroid ice which had provided reaction mass for so long was a dark, anonymous lump, barely visible now that the great blue flame of the GUTdrive had been stilled after its thousand-year service. The spine, with its encrustation of antennae and

sensor ports, was like an organic thing, bony, coated by bleached parasites. Red sunlight pooled like blood in the antennae cups. Still fixed to the spine was the wreckage of the wormhole Interface - twisted so that its tetrahedral form was lost beyond recognition, the electric-blue sparkle of its exotic matter frame dulled.

And the lifedome itself - eggshell-delicate - was huge atop that skinny spine, like the skull of a child. Most of the dome was darkened - closed up, impenetrable - but the upper few layers still glistened with light.

Within those bland walls, Louise reflected, two thousand people still went about their small, routine lives. Beyond Louise and her close companions, there were very few within the lifedome's fragmented societies who even knew that the *Northern*'s immense journey was, at last, over.

'How are you doing down there?'

She winced. The sudden voice in her ear had been raucous, overloud - another problem with this damn old suit.

'Mark, I'm fine. How are you?'

'What can you see? What are you thinking?'

'Mostly I can see the inside of this faceplate. Couldn't you have got it cleaned up? It smells like something's been *living* in it for a thousand years.'

He laughed.

' . . . I see the stars. What's left of them.'

'Yes.' Mark was silent for a moment. 'Well, it's just as we suspected from the deconvolved reconstructions during the flight . . . but never quite believed, maybe. It's the same picture all over the sky, Louise; we've found no exceptions. It's incredible. In the five million years of our flight, stellar evolution has been forced through at least five *billion* years. And the effect isn't limited to this Galaxy. We can't even *see* the Lesser Magellanic Cloud, for example.'

The sky was lowering, oppressive. She said, 'Paradoxa got it about right, didn't they? Remember the projections they showed us in the Virtual dome in New York, when they recruited us?'

'Yes . . . wizened stars, faded galaxies. Depressing, isn't it?'

She smiled. 'Maybe. But the sky's become an astrophysicist's dream lab.'

‘But it can’t have been much of a dream for anyone left alive here, in the Solar System, when those novae and supernovae started going off. The sleet of hard radiation and massive particles must have been unrelenting, for a million years . . .’

‘Yes. A hard rain indeed. That will have sterilized the whole damn place —’

‘—if there had been anyone left alive here by then. Which we’ve yet to find evidence of. Well, we’re still following up our four leads - the maser radiation coming out of the Sun, the *very* strange gravity waves coming from Sagittarius, the artifact in the ice, here on Callisto, and that weak beacon in transPlutonian space . . . But we’re no further forward understanding any of it.’

‘I can see the forest,’ Spinner murmured, her faceplate upturned.

Louise studied the lifedome more carefully, enhanced the image with artificial colours - and there, indeed, she could see a thin layer of Earth green at the leading edge of the lifedome, the layer of living things stained dark by the aged sunlight.

That pet forest, she thought suddenly, might be the only *green* left, anywhere in the Universe.

Absurdly, she felt her throat tightening; she found it difficult to pull her gaze away from that drifting particle of *home.*

There was a hand on her arm, its weight barely registering through the numbing, stiff fabric of the suit. Spinner smiled. ‘I know how you feel.’

Louise peered through the faceplate at this odd girl-woman, with her glinting spectacles and her round, childish face.

After Spinner’s father had wrecked the Interface - and with it, any chance of getting home again - Louise had offered Spinner and her people AS-treatment. And, looking at Spinner now, fifty years later, it was hard to remember that this was no longer a child, but a sixty-five-year-old woman.

‘I *doubt* you know how I feel,’ she said coldly. ‘I doubt it very much.’

Spinner studied her for a few moments, her painted face expressionless behind her plate.

They climbed back into the pod.

The little ship rose to a height of a mile, then levelled off and coasted parallel to the surface. Louise looked back. Their landing jets had blown a

wide, shallow crater in the ice; it marred a plain which stretched, seamless and featureless, to the close horizon.

Louise sat in her seat; surrounded by the disconcertingly transparent hull, she felt - as always, in these pods - as if she were suspended in space. Below them the Callisto plain was a geometrical abstraction; above them, *Northern* climbed patiently past the deep, gleaming rings of Jupiter, a spark against those smooth arcs.

The main activity on Callisto was centred around Morrow's excavation site on the far side of the moon, the Jupiter-facing side. The purpose of this jaunt was to have a general scout, and to give Spinner-of-Rope some more experience of working outside the ship, the *feel* of standing on a planet surface . . . Even, Louise thought, a surface so featureless, and with a sky so bare, that the moon had become almost an abstract representation of a planet.

Still, Louise knew it did *her* good to get away from the ship that had been her home, and prison, for so many centuries - and which, barring a miracle, was going to have to sustain her and her people for the rest of her life. Callisto was - had been - Jupiter's eighth moon, one of the four big Galilean satellites. At the time of *Northern*'s launch, Callisto had been a ball of water ice and rock, heavily cratered. Debris had been sprayed across the mysterious surface from the bright cores of the impact craters; from space, Callisto had looked like a sphere of glass peppered by gunshots. One basin - called Valhalla - had been four hundred miles across, an immense amphitheatre surrounded by concentric terrace-like walls.

Louise remembered how human cities, feeding on Callisto's ancient water, had glinted in the shadows of Valhalla's walls, shining like multicoloured jewels.

Well, the craters had gone now - as had Valhalla, and all the cities. Gone without trace, it seemed. Callisto had been wiped smooth, unblemished save for her own footsteps.

During, or after, the depopulation, Callisto had been caused to *melt*. And, when the moon froze once more, something had been trapped in the ice . . .

The pod skimmed around the smooth limb of the moon. They were heading over the moon's north pole, and soon, Louise realized, they would be passing over the sharp terminator and into daylight.

. . . Or what passed for daylight, in these straitened times, she thought. Beside her, Spinner fitted her faceplate over her head, leaving it open below her mouth. She peered around, through the flimsy walls of the pod. From the absent, unfocused expression in her eyes, Louise could tell she was using the plate's enhancement and magnification features.

'I can see moons,' Spinner said. 'A sky full of moons.'

'Nice for you,' Louise said dryly. 'There should be eight - there used to be eight beyond Callisto. Small, irregular: probably captured asteroids. The outer four of them were retrograde, moving backwards compared to the planet's own rotation.'

'I'm surprised any moons survived the destruction of the planet.'

Louise shrugged. 'The nearest of the outer moons was a hundred and fifty Jovian radii from the primary, before the planet imploded . . . even Callisto survived, remember, and that was a mere twenty-six radii out.' The orbits of the surviving moons had been disturbed by the Jovian event, of course; the implosion had sent them scattering with a shock of gravity waves, and now they swooped around their shattered parent along orbits of high eccentricity, like birds disturbed by earth tremors.

Within the orbit of Callisto, nothing had survived.

Now, as the pod passed over the pole, the Jovian ring system unfolded like a huge floor before Louise, infinite-flat and streaked with shadows.

This new ring system, the debris of worlds, lay in what had been Jupiter's equatorial plane - the plane once occupied by the vanished moons. Callisto still lay in the equatorial plane, patiently circling the site of the giant planet just outside the ring system, so that the disc of ring material - if it had stretched out so far - would have bisected Callisto neatly.

The ring system didn't terminate at a sharp inner boundary, like Saturn's. Instead the creamy, smoothed-out material stretched inwards - this system was actually more a disc than a ring system, Louise realized slowly. As her eyes tracked in towards the centre the system's texture slowly changed - becoming more rough, Louise saw, with knots of high density locked into the churning surface, orbiting through tight circles, swirling visibly.

The whole assemblage was stained crimson by scattered sunlight.

The rings were almost featureless - *bland*, without the complex colours and braids which characterized Saturn's system. Louise sighed. The

gravitational interaction of moons had provided Saturn's rings with their fantastic structure. The trouble was that Jupiter's remaining moons simply weren't up to the job of shepherding the rings. For poor, dead Jupiter, only a single dark streak marked the orbital resonance of Callisto itself.

Now, the centre of the ring-disc rose above Callisto's sharp horizon. Louise could clearly see inhomogeneities churning around the geometric centre of the disc, twisting through their crowded, tortured orbits. But the disc centre itself was unspectacular - just a brighter patch, spinning with the rest of the disc. It was somehow frustrating, as if there were something missing.

Spinner sounded disappointed. 'I can't see anything in the middle. Where the planet used to be.'

Louise grinned. 'You'd hardly expect to. A black hole with Jupiter's mass would have a diameter of just twenty feet or so . . .'

'There's plenty to see in higher frequencies,' Mark cut in. 'The X-ray, and higher . . .

'Towards the heart of the system we have a true accretion disc,' he went on, 'with matter being heated tremendously before falling into the black hole itself. It's small, but there's a lot of structure there, if you look at it in the right bands.'

Spinner, with apparent eagerness, adjusted her plate over her face, and Mark told her how to fix the settings. Soon, Spinner's eyes assumed that unfocused look again as they adjusted to the enhanced imagery.

Louise left her own visor in her lap; the black hole, and its huge, milky ring, depressed her enough in visible light.

Jupiter's new ring system, with its bland paleness, and the jostling, crowding swirl at the centre, was far from beautiful, on any wavelength. It was too obviously a place of wreckage, of *destruction* - a destruction which was visibly continuing, as the black hole gnawed at its accretion disc. And, to Louise's engineer's eye, with its empty centre the system had something of an unfinished, provisional look. There was no *soul* to this system, she thought, no balance to the scale of the rings: by comparison, Saturn's rings had been an adornment, a necklace of ice and rock around the throat of an already beautiful world.

Spinner turned to her, her bespectacled eyes masked by the faceplate. 'The whole thing's like a whirlpool,' she said.

Louise shrugged. ‘I suppose so. A whirlpool surrounding a hole in spacetime.’

‘A whirlpool of gas—’

—gas, and rock and water ice: bits of smashed-up worlds—

Louise started to tell Spinner-of-Rope about the vanished moons of Jupiter. She remembered Io with its volcano mouths and their hundred-mile-high vents, its sulphur-stained surface and its surrounding torus of volcano-fed plasma; she remembered Io’s mineral mines, nestling in the shadow of the huge volcano Babbar Patera. She told Spinner of Ganymede: larger than Mercury, heavily cratered and geologically rich - the most stable and heavily populated of all the Jovian moons. And Europa, a ball of ice, with a bright smooth surface - constantly renewed by melting and tectonic stress - covering a liquid layer beneath. Europa had been a bright precursor of this smoothed-over corpse of Callisto, perhaps.

Worlds, all populated - all gone.

Louise hoped fervently that there had been time to evacuate the moons before the final disaster. If not, then - drifting through Jovian orbit among the fragments of rock and ice which comprised those rings - there would be bits of humanity: shards of shattered homes, children’s toys, corpses.

Spinner pushed up her faceplate and rubbed her eyes. ‘I’d have liked to have seen Jupiter, I think, with its moons and all those cities . . . Perhaps Jupiter could have been saved. After all, the implosion must have taken thousands of years, you told me.’

Louise bit back a sarcastic reply. ‘Yes. But picking black holes out of the heart of a gas giant was evidently a bit too difficult, even for the humans of many millennia beyond my time.’

Jupiter had been wrecked by the actions of the Friends of Wigner.

The Friends were human rebels from a Qax-occupied future, who had fled back in time through Michael Poole’s time-tunnel wormhole.

The Friends had had in mind some grand, impossible scheme to alter history. Their plan had involved firing asteroid-mass black holes into Jupiter.

The Friends’ project had been interrupted by the arrival of Qax warships through Poole’s wormhole - but not before the Friends had succeeded in spearing the giant planet with several of their tiny singularities.

The pinprick singularities had looped through the thick Jovian atmosphere like deadly insects, trailing threads of plasma. When the holes met, they had whirled around each other before coalescing, their event horizons collapsing into each other in Planck timescales.

The vibration of merging event horizons had emitted vicious pulses of gravity waves. Founts of thick, chemically complex atmosphere had been hurled out of the planet, bizarre volcanoes on a world of gas.

The Friends' ambitions had been far-reaching. Before the final implosion they'd meant to *sculpt* the huge planet with these directed gravity-wave pulses, produced by the complex interactions of their singularity bullets.

Louise now stared morosely at the bland, displeasing disc of glowing rubble. Well, the Friends had certainly succeeded in part of their project - the reduction of Jupiter. Quite a monument to such ambition, after five million years, Louise thought: a collapsed Jovian, and a string of crushed human worlds.

And all for what? A black hole of the wrong size . . .

'It's getting brighter over there,' Spinner said, pointing.

Louise looked right, across Callisto. A dull, flat crimson light was spreading across the ice. The glow cast long, disproportionate shadows from the low irregularities in Callisto's smooth surface, turning the ice plain into a complex landscape of ruby-sparkling promontories and blood-red pools of shadow.

At the horizon, smoky tendrils of crimson gas were rising across the sky.

'Sunrise on Callisto,' Louise said sourly. 'Come on; let's land. We don't want to miss the full beauty of the Solar System's one remaining wonder, do we?'

On the surface of Callisto, standing beside Louise in her environment suit, Spinner held up her arms, framing the Sun with her outspread hands; standing there on the light-stained ice floor, with the swollen globe reflected, distorted, in her faceplate, Spinner-of-Rope looked more than ever like a child.

Sol, looming over the horizon, was a wall of blood-red smoke. It was transparent enough to see through to the distant stars for perhaps a quarter

of the disc's radius - in fact, the material was so thin that Louise could make out the steadily deepening colour of the thicker layers towards the core.

The Sun didn't even *look* like a star any more, she thought tiredly. A star was supposed to be hard, bright, hot; you weren't supposed to be able to see *through* it.

'Another astrophysicist's dream,' Mark said dryly. 'You could learn more about the nature of stellar evolution just by standing there and *looking*, than in all the first five millennia of human astronomy.'

'Yes. But what a price to pay.'

Once, from Jupiter's orbit the Main Sequence Sun would have been a point source of light - distant, hot, yellow. Now, the Sun's arc size had to be at least twenty degrees. Its bulk covered fully a fifth of Louise's field of view: twenty times the width of the full Moon, as seen from Earth.

Jupiter was five AU from the Sun's centre - an AU was an astronomical unit, the radius of Earth's orbit. For the Sun to subtend such an angle, it must be two AU across, or more.

Two astronomical units. In exploding out to become a giant, the Sun had swallowed the Earth, and the planets within Earth's orbit - Venus, Mercury.

Spinner-of-Rope was studying her, concern mixing with curiosity behind those pale spectacles.

'What are you thinking, Louise?'

'This shouldn't have happened for five billion more years,' Louise said. Her throat was tight, and she found it difficult to keep her voice level. 'The Sun was only halfway to turnoff - halfway through its stable lifecycle, on the Main Sequence.

'*This shouldn't have happened*. Somebody did this deliberately, robbing us of our future, our worlds - damn it, this was *our Sun* . . .'

'Louise.' Mark's synthesized voice was brisk, urgent.

She breathed deeply, trying to put away her anger, her resentment, to focus on the present.

'What is it?'

'You'd better come back to the *Northern*. Morrow has found something . . . Something in the ice. He thinks it's a spacecraft.'

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16

‘**U**varov. *Uvarov*.’

Garry Uvarov jerked awake. It was dark. He tried to open his eyes ...

As always, in that first instant of wakefulness - even after all these years - he *forgot*. His blindness crowded in on him, a speckled darkness across his eyes, making every new waking a savage horror.

‘Garry. Are you awake?’

It was the solicitous voice of that fake person, Mark Bassett Friar Armonk Wu. Uvarov swung his head around, trying to locate the source of the artificial voice. It seemed to be all around him. He tried to speak; he felt his gummy mouth open with a pop, like a fish’s. ‘Mark Wu. Where are you, damn it?’

‘Right here. *Oh*.’ There was a second of silence. Then: ‘I’m here.’

Now the voice came from directly in front of him, from a precise, well-focused place.

‘Better,’ Uvarov growled.

‘I’m sorry,’ Mark said. ‘I hadn’t formed an image. I didn’t think—’

‘You didn’t *bother*,’ Uvarov snapped. ‘Because I can’t see you, you thought it was enough to float around me in the air like some damn spirit.’

‘I didn’t think it would be so important to you,’ Mark said.

‘No,’ Uvarov said. ‘To think of that would have been too much the *human* thing to do for an imprint like you, wouldn’t it?’

‘Do you need anything?’ Mark asked, with strained patience. ‘Some food, or—’

Nothing,’ Uvarov snapped. ‘This chair takes care of it all. With me, it’s in one end and out of the other, without even having to swallow.’ He stretched his lips and leered. ‘As you know. So why did you bother to ask after my health? Just to make me feel dependent?’

‘No.’ Mark sounded cool, but more certain of himself. ‘I thought to ask would be the *human* thing to do.’

Uvarov let himself cackle at that. ‘Touché.’

‘It’s just that you sleep for such a long time, Uvarov,’ Mark said dryly.

‘So would you, if you weren’t dead,’ Uvarov said briskly.

He could hear the rattle of his own breath, the subdued ticking of a huge old clock somewhere, here in the dining saloon of Louise’s old steam ship.

Hauling this useless relic five megayears into the future had been, of course, an absurd thing to do, and it showed a fundamental weakness in the character of Louise Ye Armonk. But still, Uvarov had to admit, the textures of the old material - the painted walls, the mirrors, the polished wood of the two long tables - *sounded* wonderful.

'I suppose you had a *reason* for waking me.'

'Yes. The Sun maser probes—'

'Yes?'

'We're starting to get meaningful data, Uvarov.' Now Mark sounded excited, but Uvarov never let himself forget that every inflection of this AI's voice was a mere artifice.

Still, despite this cynical calculation, Uvarov too began to feel a distinct stirring of interest - of wonder. *Meaningful data?*

The maser radiation was coming from hot-spots on the photosphere itself - patches of intense maser brightness, equivalent to tens of millions of degrees of temperature, against a background cooler than the surface of the yellow Sun had once been. The convection mechanism underlying the maser flares' coherent pathways fired the radiation pulses off tangentially to the photosphere. So the *Northern* had sent out small probes to skim the swollen, diffuse surface of the photosphere, sailing into the paths of the surface-grazing maser beams.

'Tell me about the data.'

'It's a repeating group, Uvarov. Broadcast on maser wavelengths, from within what's left of the Sun . . . Uvarov, I think it's a *signal*.'

They hadn't learned much about the Solar System, in the year since their clumsy, limping arrival from out of the past. So many of the worlds of man simply didn't exist any more.

Still, in the quiet time before the arrival of the *Northern* at Jupiter, Uvarov and the AI construct had performed some general surveys of the Solar System - what was left of it. And they'd found a few oddities . . .

There was what looked like one solid artifact - Morrow's anomalous object buried in the ice of Callisto. And, apart from that, there were just three sources of what could be interpreted as intelligently directed signals: this maser stuff from the Sun, the fading beacon from the edge of the System, and - strangest and most intriguing of all, to Garry Uvarov - those strange pulses of gravity radiation from the direction of Sagittarius.

Uvarov had done a little private study, on the structure of the Universe in the direction of Sagittarius. Interestingly enough, he learned, the cosmic structure called the *Great Attractor* was to be found there, right at the place the photino beam was pointing. The Attractor was a huge mass concentration: the source of galactic streaming, for hundreds of millions of light-years' distance around. Could the Attractor be connected to the g-waves?

And then there was all that strange photino activity in and around the Sun.

The data was patchy and difficult to interpret - after all, dark matter was, almost by definition, virtually impossible to study . . . but there *was* something strange there.

Uvarov thought he'd detected a *streaming.*

There was a steady flow, of photino structures, out of the heart of the Sol giant . . . and on out of the Solar System. It was a beam of photinos aimed like a beacon, out of Sol - and straight towards the source of the anomalous gravity waves in Sagittarius.

Something was happening in Sagittarius - something huge, and wonderful, and strange. And, somehow, impossibly, it was connected to whatever was taking place in the heart of the poor, suffering Sun.

. . . The Virtual, Mark Armonk, was talking to him again. Or perhaps *at* him, Uvarov thought sourly.

'I wish you'd pay attention, Uvarov—'

'Without me to talk to, you'd lapse into non-sentience, devoid of independent will,' Uvarov pointed out. 'So spare me the lectures.'

Mark ground out, 'The *Sun,* Uvarov. The photosphere maser radiation is standard stuff - generated by silicon monoxide at 43 Gigahertz. There are natural mechanisms for generating such signatures. But in this case, we've found hints of *modulation* of the silicon monoxide stuff . . . deliberate modulation.

'We've found structure *everywhere*, Uvarov.' Again that fake excitement in Mark's voice; Uvarov felt his irritation grow. Mark went on, 'There is structure in the amplitude of the beams, their intensity, phasing, polarization - even in the Doppler shifting of the signals. Uvarov, someone - or something - is *in there*, trying to signal out with modulated natural masers, as hard as they can. I'm trying to resolve it, but . . .'

Uvarov strove to shift in his chair, vainly trying to find a more comfortable posture - a prize he'd been seeking for the best part of a thousand years, with as much assiduousness as Jason had once sought his Fleece, he thought. How *pathetic*, how limited he was!

He tried to ignore his body, to fix his analytical abilities - his imagination - on the concept of an intelligence within the Sun . . .

But it was so difficult.

His mind wandered once more. He thought of his forest colony. He thought of Spinner-of-Rope.

Sometimes Uvarov wondered how much better *young* people might have fared, if they'd been given this opportunity to study and learn, with this strange, battered Universe as an intellectual playground. How much more might youth have unearthed, with its fresh eyes and minds, than *he* could!

It had already been fifty years since - in his misguided, temporary lunacy - he had inspired his forest children to undertake their hazardous journey out of the lifedome. *Fifty years:* once most of a human lifetime, he thought - and yet, now, scarcely an interlude in his own, absurdly long life, stuck as he was in this mouldering cocoon of a body.

So even Spinner-of-Rope, Arrow Maker's wise-ass daughter, must be - what, sixty-five chronological? Seventy, maybe? An old woman already. But still, thanks to AS-freezing, she'd retained the features - and much of the outlook, as far as he could tell - of a child.

He felt a great sorrow weigh upon him. Of course his experiment was lost, now; his carefully developed gene pool was already polluted by interbreeding, no doubt, between the forest folk and the Paradoxa-controlled Decks, and his immortal strain was overwhelmed by AS treatments.

But the progress he had made was still there, he thought; the *genes* were there, dormant, ready. And when - *if* - the inhabitants of the *Northern* got through this time of trouble, when they reached whatever new world waited for them, *then* the great experiment could begin anew.

But in the meantime . . .

He thought again of Spinner-of-Rope, a girl-woman who had grown up among trees and leaves, now walking through the wreckage of the Solar System.

Uvarov had made many mistakes. Well, he'd had *time* to. But he could be proud of this, if nothing else: that to this era of universal desolation and ruin, he - Garry Uvarov - had restored at least a semblance of the freshness of youth.

' . . . Uvarov,' Mark said.

Uvarov turned. The Al's synthesized voice sounded different - oddly flat, devoid of expression. *None of that damn fake intonation, then*, Uvarov thought with faint triumph. It was as if the Virtual's processing power had, briefly, been diverted somewhere else. Something had *happened.*

'Well? What is it?'

'I've done it. I've resolved the signal - the information in the maser pulses. There's an image, forming in the data desk . . .'

'An image? *Tell me*, damn you.'

It was a woman's face (Mark said), crudely sketched in pixels of colour. A *human* face. The woman was aged about sixty-five physical; she had short-cropped, sandy hair, a strong nose, a wide, upturned mouth, and large, vulnerable eyes.

Her lips were moving.

'*A woman's face* - after five million years, transmitted out on maser signals from the heart of a Sun rendered into a red giant? I don't believe it.'

Mark was silent for a moment. 'Believe what you want. I think she's trying to say something. But we don't have sound yet.'

'How very inconvenient.'

'Wait . . . Ah. Here it comes.'

Now Uvarov *heard* it, heard the voice of the impossible image from the past. At first the timbre was broken up, the words virtually indecipherable, and, so Mark informed him, badly out of synchronization with the moving lips.

Then, after a few minutes - and with considerable signal enhancement from the data desk processors - the message cleared.

'Lethe,' Mark said. 'I even recognize the language . . .'

My name is Lieserl. Welcome home, whoever you are. I expect you're wondering why I've asked you here tonight . . .

Against the dull red backdrop of the ruined, inflated Sun, the accretion disc of the Jovian black hole sparkled, huge and threatening.

Once more a pod from the *Northern* carried Spinner-of-Rope - alone, this time - down to the surface of Callisto. Spinner twisted to look down through the glass walls of the little pod; as she moved, biomedical sensors within her suit slid over her skin, disconcerting.

The craft from within the ice, dug up and splayed out against the surface by a team of autonomous ‘bots, was like a bird, with night-dark wings a hundred yards long trailing back from a small central body. The wing material looked fragile, insubstantial. The ice of Callisto seemed to show through the wings’ trailing edges.

Louise and Mark had told her that the craft was alien technology. And it had a *hyperdrive*, they thought . . .

She scratched at her shoulder, where one of Mark’s damned biosensors was digging particularly uncomfortably into her flesh. When she landed, Louise was damn well going to have to tell her why she’d been buttoned up like this.

The craft was more like some immense, black-winged insect, resting on a sheet of glass, Spinner thought. Its elegant curves were surrounded by the stumpy, glistening forms of the *Northern*’s pods, and by other pieces of equipment. Spinner could see a small drone ‘bot crawling across the surface of one nightdark wing, trailing twisted cable strands and scrutinizing the alien material with clusters of sensors. The Callisto ice around the craft was scarred and broken, pitted by the landing jets of the pods and criss-crossed by vehicle tracks.

The craft was *immense*. The activities of the humans and their machines looked utterly inadequate to contain the power of this artificial beast . . . if it were to awake from its centuries-long slumber.

Spinner’s fear seemed to rise in inverse proportion to her nearness to the craft. It was as if the sinister insectile form, pinned against the ice, radiated threat.

She shivered, pulling the fabric of her environment suit close around her.

The streets and houses around Morrow were empty. The endless, ululating cries of the klaxon echoed from the bare walls, of the ruined buildings and the steel underbelly of the sky.

A grappling hook - a crude thing of sharpened, twisted partition-metal - sailed past Morrow’s face, making him flinch. The hook caught in some

irregularity in the floor of the Deck, and the rope it trailed stiffened, jerking. Within a few seconds Trapper-of-Frogs had come swarming along the rope, across the Deck floor; her brown limbs, glistening with sweat, were flashes of colour against the grey drabness of the Deck's sourceless light, and her blowpipe and pouch of darts bounced against her back as she moved.

Morrow sighed and dropped his face. In zero-gee, they were abseiling across the floor of Deck Two. The metal surface before his face was bland, incongruously familiar, worn smooth by countless generations of feet, including his own. He twisted his neck and took a glance back. His other companions were strung out across the surface of the Deck behind him, their faces turned to him like so many flowers: there was Constancy-of-Purpose with her powerful arms working steadily, and her dangling, attenuated legs, the Virtual Mark Wu, a handful of forest folk. The Virtual was trying to protect their sensibilities, Morrow saw, by making a show of climbing along the ropes with the rest of them.

The Temple of the Planners was a brooding bulk, outlined in electric blue, still hundreds of yards ahead, across the Deck.

Many of the houses, factories and other buildings were damaged - several quite badly. In one corner of Deck Two there was evidence of a major fire, a scorching which had even licked at the grey metal ceiling above.

Morrow tried to imagine what it must have felt like to have been here, in the cramped, enclosed world of the Decks, when the GUTdrive had finally been turned off - when *gravity* had faded out. He imagined walking along, on his way to another routine day at work - and then that strange feeling of lightness, *his feet leaving the Deck* . . .

The klaxon had called out ever since they'd climbed down here, into the Decks, through the Locks from the forest; perhaps it had been wailing like this ever since the zero-gee catastrophe itself. The noise made it difficult even to *think;* he tried to control his irritability and fear.

Trapper twisted and grinned at him. 'Come on, Morrow, wake up. You climbed all the way down the elevator shaft with Spinner-of-Rope, once, didn't you? And that was under gravity. Zero-gee is *easy*.'

'Trapper, *nothing* is easy when you get to my age.'

Trapper laughed at him, with all the certainty of youth. And it was *genuine* youth, he reflected; Trapper was - what? Eighteen, nineteen?

Children continued to be born, up in the forest, even all these decades after the opening-up of the Locks on Deck One, and the provision of AS treatment for the forest folk.

‘You know,’ he said, ‘you remind me of Spinner-of-Rope.’

Trapper twisted easily, as if her small, bare body had all the litheness of rope itself; her face was a round, eager button. ‘Really? Spinner-of-Rope’s something of a hero up there, you know. In the forest. It must have taken a lot of courage to follow Uvarov down through the Locks, and—’

‘Maybe,’ Morrow said testily. ‘What I meant was, you’re just as *annoying* as she was, at your age.’

Trapper frowned; there was a sprinkling of freckles across her small, flat nose, he saw, and a further smattering that reached back across her dark-fringed patch of shaven scalp. Then her grin broke out again, and he felt his heart melt; her face reminded him of the rising of a bright star over the ice fields of Callisto She craned her neck forward and kissed him lightly on the nose.

‘All part of the package,’ she said. ‘Now come *on*.’

She scrambled up her rope again; within seconds she had reached her grappling hook and was preparing to throw the next one across the Deck, in preparation for the next leg of the trek.

Wearily, feeling even older than his five centuries, Morrow made his way, hand over hand, along his rope.

He tried to keep his eyes focused on the scuffed floor surface before his face. Why was he finding this damn jaunt so *difficult*? He was, after all, Morrow, Hero of the Elevator Shaft, as Trapper had said. And since then he had been out, beyond the ribbed walls surrounding the Decks, out into space. He had walked the surface of Callisto, and watched the rise of the bloated corpse of legendary Sol over the moon’s ice plains; he had even supervised the excavation of that ancient alien spacecraft. He’d shown courage then, hadn’t he? He must have done - why, he hadn’t even *thought* about it. So why did he feel so different, now he was back here, inside the Decks once more - inside the metal-walled box which had been his only world for half a millennium?

He’d been apprehensive ever since Louise had asked him to lead this expedition in the first place.

‘I don’t *want* to go back in there,’ he’d told Louise bluntly.

Louise Ye Armonk had come down to Callisto to congratulate him on his archaeology and to give him this new assignment. She had looked tired, old; she'd run a hand through grizzled hair. 'We all have to do things we don't want to do,' she said, as if speaking to a child, her patience barely controlled. When she'd looked at him, Morrow could detect the contempt in her eyes. 'Believe me, if I had someone else to send, I'd send 'em.'

Morrow had felt a sense of panic - as if he were being asked to go back into a prison cell. 'What's the point?' he asked, his desperation growing. 'The Planners closed off the Decks centuries ago. *They* don't want to know what's happening outside. Why not leave them to it?'

Louise's mouth was set firm, fine wrinkles lining it. 'Morrow, we can't afford to "leave them to it" any more. The Universe outside - *we* - are impinging on what's happening in there. And we've evidence, from our monitors, that the Planners are not - ah, not reacting well to the changes.

'Morrow, there are two thousand people in there, in the Decks. There are only a handful of us outside - only a few hundred, even including the forest on Deck Zero. We can't afford to abandon those two thousand to the Planners' deranged whims.'

Morrow heard his own teeth grind. 'You're talking about *duty*, then.'

Louise had studied him. 'Yes, in a way. But the most fundamental duty of all: not to me, or to the Planners, or even to the ship's mission. It's a duty to the *species*. If the species is to survive we have to protect the people trapped in there, with the Planners - as many as possible, to maintain genetic diversity for the future.'

'*Protect*,' he said sourly. 'Funny. That's probably just what the Planners believe they are doing, too . . .'

Now he looked around at the abandoned houses in their surreal rows, suspended from what felt like a vertical wall to him now, not a floor; he listened to the silence broken only by the plaintive cries of the klaxon. All the people had gone - taken, presumably into the Temples, by the Planners - leaving only this shell of a world; and now the elements of this oppressive place seemed to move around him, pushing at him like elements of a nightmare . . .

Perhaps it was the very *familiarity* of the place that was so uncomfortable. Coming back here - even after all these decades - it was as if he had never been away; the metal-clad walls and ceiling, the rows of

boxy houses, the looming tetrahedral bulks of the Planner Temples all loomed closely around him, oppressing his spirit once more. It was as if the huge, remarkable Universe beyond these walls - of collapsing stars, and ice moons, and magical alien spacecraft with wings a hundred yards wide - had never existed, as if it had all been some bizarre, fifty-year fantasy.

In the old days, before his first encounter with Arrow Maker and Spinner, he'd thought himself something of a rebel. An independent spirit; a renegade - not like the rest of the drones around him. But the truth was different, of course. For centuries, the culture of the Planners had trained him into submission. If it hadn't been for the irruption of the forest folk - an event from outside his world - he'd never have had the courage, or the initiative, to break free of the Planners' domination.

In fact, he realized now, no matter what he did or where he went in the future - and no matter how this conflict with the Planners turned out - he never *would* be free of that oppression.

Now he reached the end of his rope. He let himself drift away from the Deck a little, and launched himself through the air across the few feet to the next rope Trapper had fixed. He glanced back again; the little party was strung along the chain of ropes which led all the way back to the ramp from the upper levels.

There was a rush of air above his head, a sizzling, hissing noise.

Instinctively he ducked down, pressing his body flat against the Deck; infuriatingly he bounced away from the scarred surface, but he grasped the edges of Deck plates and clung on.

The noise had sounded like an insect's buzz. But there were very few insects within the Decks . . .

Another hiss, a sigh of air above him. And it had come from the direction of the Temple which was - he sneaked a look up - still a hundred yards away. Another whisper above him - and another, and now a whole flock of them.

Someone behind him cried out, and he heard the clatter of metal against the Deck.

Trapper-of-Frogs came clambering back down the rope towards him; without inhibition she scrambled over his arms and snuggled against his side, a warm, firm bundle of muscle; her shaven patch of scalp was smooth

against his cheek. She was no more than four feet tall, and he could feel her bony knees press into his thighs.

‘It’s the Planners,’ she whispered into his ear. Her breath was sweet, smelling of forest fruit. ‘They’re *shooting* at us from the Temple.’

He felt confused. ‘Shooting? But that’s impossible. Why should they?’

She growled, and again he was reminded of a young Spinner-of-Rope, decades ago, who also had spent a lot of time getting annoyed at him. ‘How should I know?’ she snapped. ‘And besides, *why* hardly makes a difference. What’s important is that we get *out* of here before we get hurt.’

He clung to his rope, disoriented. Maybe he should have been prepared for this. Maybe the Planners really *had* gone that crazy.

But if that was true, what was he supposed to *do* about it?

Now someone else came clambering up behind him. It was Constancy-of-Purpose, pawing her way across the Deck with her huge, powerful right hand; she clutched something shiny and hard in her left. Those AS-wasted legs, Morrow thought irrelevantly, looked even slimmer than Trapper’s; they clattered against the Deck, pale and useless.

‘Morrow.’ Constancy-of-Purpose opened her left hand. The object nestling within it was a piton: sharpened, the coarse, planed surfaces of its point glistening in the sourceless light. ‘This look familiar? The Planners are using their damn crossbows on us again.’

‘But why?’

Constancy-of-Purpose looked exasperated, even amused. ‘*Why* hardly matters, does it?’

Trapper punched Morrow in the ribs, lightly; he winced as her small, hard fist dug into the soft flesh. ‘That’s what I’ve been telling him, too,’ she told Constancy-of-Purpose.

‘At the moment they’re hitting the Deck behind us,’ Constancy-of-Purpose said urgently. ‘They are shooting over our heads. Maybe they’re trying to find their range. Or maybe they’re just trying to warn us; I don’t know. But as soon as they like, they’ll be able to pick us off . . . Come on. We have to retreat.’

Morrow, still confused, twisted his head to study the Temple ahead of him. The building’s tetrahedral form, with its outline of electric blue and triangular faces of golden-brown, was no longer a seamless whole. Windows had been knocked out of the nearest face, leaving black, gaping

scars. He saw small figures in those windows: men and women, dressed in the drab, uniform coveralls he'd worn himself for so many centuries.

They were raising bows towards him.

'All right,' he said, wishing only that this were over. 'Let's move out of range. Come on; Constancy-of-Purpose, you lead the way . . .'

The pod landed close to the stern of the night-dark craft. Spinner climbed down onto the ice of Callisto.

Around her waist she'd tied a length of her own rope, and within her suit, suspended on a thread between her breasts, was one of her father's arrow-heads. She raised her hand to her chest and pressed the glove against the fabric of her suit; the cool metal of the arrow-head dug into her flesh, a comforting and familiar shape. She tried to regulate her breathing, looking for bits of comfort, of stability. Even the gravity here was wrong, of course; and the presence of the heavy suit over her flesh, with Mark's biostat probes inside, was a constant, scratching irritant.

Louise Ye Armonk walked up to the pod, leaving shallow footprints in the frost of Callisto. The engineer had turned up an interior light behind her faceplate.

'Spinner-of-Rope.' Louise held out her hand and smiled. 'Well, here we are again. Come on. I'll show you around the craft.'

Spinner took Louise's hand. Slowly, her feet crunching softly against the worn ice, she walked with Louise to the craft.

The rings of Jupiter arced across the sky, a plain of bloodstained, frozen smoke. The craft lay against the ice, dark, vital.

They drew to a halt perhaps ten feet from the edge of the nearest wing. The wing hovered a few feet above the ice, apparently unsupported; perhaps it was so light it didn't need support, apart from its join with the central trunk of the ship, Spinner thought. Beyond the leading edge the wing curved softly, like a slow, frozen billow of smoke; its form, foreshortened, was sharply delineated against the bland ice backdrop of Callisto, but its utter darkness made the scale of the wing's curves hard to judge. At the trailing edge of the wing, the material was so delicate that Spinner - bending, and peering upwards - could see *through* the fabric of the wing, to the wizened glow of the stars.

'In form the ship is like a sycamore seed.' Louise glanced across at Spinner. 'Do you have sycamores in your forest? . . . Here are these lovely

wings, which sweep back through a hundred yards. The small central pilot's cage sits on top of the "shoulders" of the ship - the base of the wings.'

Lovely, Louise had said. Well, Spinner reflected, perhaps there was a certain loveliness here - but it was a beauty that was utterly inhuman, and endlessly menacing.

'This isn't a human ship,' she said slowly. 'Is it, Louise?'

'No.' Louise set her shoulders. 'Damn it,' she said sourly. 'We find one reasonably complete artifact in the rubble of the Solar System, and it has to be alien . . .

'Spinner, we think this is a *Xeelee* craft. We've checked the old Paradoxa projections; we think this is what the Friends of Wigner - the people from the Qax occupation era - called a *nightfighter*. A small, highly mobile, versatile scout craft.'

The leading edge of a sycamore-seed wing was at a level with Louise's face; now she raised a gloved hand and made as if to pass a fingertip along that edge. Then, thoughtfully, she drew her hand back. 'Actually, we wouldn't advise that you touch anything, unless you have to. This stuff is *sharp*. The wings, and the rest of the hull, are probably made of Xeelee *construction material*.'

She ducked her head and sighted along the plane of the wing. Spinner had to stand on tiptoe to do the same. When she did manage to raise her eyes to the level of the wing, the Xeelee material seemed to disappear, such was its fineness. Even this close it was utterly black, returning no reflections from the ice, or the Jovian rings above. It wasn't like anything *real*, she thought; it was as if a slice had been taken out of the world, leaving this hole - this *defect.*

Louise said, 'This stuff resists analysis. Uvarov and Mark suggest that the construction material is a sheet of bound nucleons - bound together by the strong nuclear force, I mean, as if this was some immense, spun-out atomic nucleus.

'But I'm not so sure. The density doesn't seem right, for one thing. I have a theory of my own: that what we're looking at is something more fundamental. I think the Xeelee have found a way to suppress the Pauli Exclusion Principle, and so have found their way into a whole new regime of matter. Of course the problem with that theory is that there aren't

supposed to *be* any loopholes in the Exclusion Principle. Well, I guess nobody told the Xeelee about that . . .'

'How did they make this stuff?'

Louise smiled. 'If you believe the old Paradoxa reconstructions, they *grew* it, from "flowers". Construction material simply sprouted like petals from the flowers, in the presence of radiant energy.

'It would be interesting to know how this ship got here, to Callisto, in the first place,' she said. 'Capturing a Xeelee craft must have been a great triumph, for humans of any era.

'Uvarov thinks this moon was used as a lab. This site, remote from the populated colonies, was a workshop - a safe place to study the Xeelee craft. There must have been research facilities here, built around the nightfighter, as the people of the time tried to pry out the secrets of its intrasystem drive, its hyperdrive, the construction material. But we've found little evidence of any human occupation, apart from close to this nightfighter. When the war came—'

'What war?'

Louise dropped her faceless, helmeted head. 'A war against the Xeelee, Spinner. One of many wars. More than that I doubt we'll ever know.

'In the final war, the human facilities - and any people here - were destroyed, all save a few scraps. But—'

'But the Xeelee nightfighter survived,' Spinner said.

Louise smiled. 'Yes. The Xeelee built to last. Whatever happened was enough to *melt Callisto's ice*. But the nightfighter sank into the new oceans, and was trapped in there when Callisto froze again.'

Spinner thought: *Trapped, dormant, for an immeasurable time - perhaps a million years.*

'And they never came back,' Louise said. The people, I mean. The humans. They never recovered, to return here to rebuild. Perhaps that really was the war to end all wars, as far as Sol was concerned . . .

'Here's the pilot cage, Spinner-of-Rope . . . Well, now you can see why I need your help.'

Spinner-of-Rope stared at the squat cage of construction material. *It was barely six feet across.*

She felt a prickly cold spread across her limbs.

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17

A simple metal stepladder rested against the side of the cage; the ladder looked incongruously primitive, amid all this alien high technology.

Spinner looked at the ladder with dread. ‘Louise,’ she said. ‘I have to climb in. Don’t I?’

Louise, bulky and anonymous in her environment suit, stood close beside her. ‘Well, that’s the general idea. Look, Spinner-of-Rope, we need a pilot . . .’ Her voice trailed off; she shrugged her shoulders, uncertain.

Spinner closed her eyes and took deep breaths, trying to still the shuddering, deep in her stomach. ‘*Lethe*. So that’s why I’m all wired up.’

‘I’m sorry we didn’t tell you before bringing you down here, Spinner. We didn’t know what was best. Would telling you have made things any easier?’

‘I don’t get a choice, do I?’

Louise’s face, through her plate, was hard. ‘You’re the best candidate we have, Spinner-of-Rope. We *need* you.’

Without letting herself think about it, Spinner grabbed the ladder and pulled herself up.

She looked into the pilot’s cage. It was an open sphere made of tubes of construction material. The tubes were arranged in an open lattice which followed a simple longitude-and-latitude pattern. Inside the cage was a bow-shaped console, of the black Xeelee material. Other devices, made of dull metal - looking crude by comparison, obviously human - had been fixed to the Xeelee console.

A human couch had been cemented into the cage, before the console. Straps dangled from it. To fit into the cramped cage, the couch had been made small - too small for any human from the Decks but a child . . . or a child-woman from the forest.

‘I’m going to climb in, Louise.’

‘Good. But for Life’s sake, Spinner-of-Rope, until I tell you, *don’t touch anything*.’

Spinner swung her legs, easily in the light gravity, through the construction-material frame and into the cage.

The couch fitted her body closely - as it should, she thought resentfully, since it had obviously been *made* for her - but it was *too* snug. The couch -

the straps across her chest and waist, the bulky, crowding console before her - *devoured* her. The cage was a place of shadows, criss-crossing and mysterious, cast by the Jovian ring and the ice below her. It pressed around her, barely big enough for the couch and console.

She looked out through her murky faceplate, beyond the construction-material cage, to the ice plains of Callisto. She saw the blocky forms of the *Northern*'s 'bots, the pod that had brought her here, the shadowy figure of Louise. It all seemed remote, unattainable. The only reality was herself, inside this suit, this alien craft - and the sound of her own breathing loud in her ears.

Spinner had got used to a lot of changes, in the few decades since she and her father had climbed down through the lifedome with Morrow. Just *not growing old* had been a challenge enough. Most of her compatriots in the forest had refused the AS treatments offered to them by Louise, and after a few years the physical-age differences had grown marked, and widened rapidly.

Spinner had a younger sister: Painter-of-Faces, Arrow Maker's youngest child. By the time the little girl had grown older than Spinner could remember her mother, Spinner had let her visits back to the forest dwindle away.

The life of the forest people carried on much as it always had done - despite the end of the *Northern*'s journey and the discovery of the death of the Sun. Because of her greater awareness - her wider understanding - Spinner felt shut out of that old, enclosed world.

Isolated by age and by her own extraordinary experiences, she had tried to grow accustomed to the bizarre Universe outside the walls of the ship. And, over the years, she'd learned a great deal; Louise Ye Armonk, despite the ghastly way she had of patronizing Spinner, had assured her often of the great strides she'd made for someone of her low-technology upbringing.

But now, she longed to be away from this bleak, threatening place - to be naked again, and moving through the trees of the forest.

'Spinner-of-Rope.' It was the voice of the artificial man, Mark, soft inside her helmet. 'You've got to try to relax. Your biostat signs are way up —'

'Shut up, Mark.' Louise Ye Armonk walked up to the Xeelee cage and pressed her body against the black bars, peering in; she'd turned on the light

behind her faceplate, so Spinner could see her face. ‘Spinner, are you all right?’

Spinner took a deep breath. ‘I’m fine.’ She tried to focus on her irritation: with patronizing Louise, the buzzing ghost Mark. She fanned her annoyance into a flame of anger, to burn away the chill of her fear. ‘Just tell me what I have to do.’

‘Okay.’ Louise lifted her hands and stepped back from the cage. ‘As far as we can tell, the cage you’re in is the control centre of the nightfighter. You can see, obviously, that it’s been adapted for use by humans. We put the couch in for you. You have waldoes—’

‘I have *what*?’

‘Waldoes, Spinner. The metal boxes on top of the console. See?’

There were three of the boxes, each about a foot long, one before Spinner and one to either side. There were touch pads - familiar enough to her now - illuminated across the tops of the boxes. She reached out towards the box in front of her—

‘*Don’t touch, damn* you,’ Louise snapped.

Spinner snatched her fingers back.

With audibly strained patience, Louise said, ‘Spinner-of-Rope, the controls in those boxes have been tied into what we believe are controls inside the console - and *they* are the nightfighter’s real controls, the Xeelee mechanisms. That’s why we called the boxes waldoes . . . By working the waldoes you’ll be able to work the controls. The waldoes are reconstructions, based on fragments left from the destruction of the original lab.’

‘All right.’ Spinner ran a tongue over her lips; sweat, dried in a rim around her mouth, tasted of salt. ‘I understand. Let’s get on with it.’

Beyond the cage, Louise held up her hands. ‘No. Wait. It’s not as simple as that. We reconstructed the waldoes from clues left by the original human researchers. We believe they are going to work . . . But,’ she went on dryly, ‘we don’t know what they will make the nightfighter *do*. We don’t know what will happen when you touch the waldoes.

‘So we’ll have to be patient. Experiment.’

‘All right,’ Spinner said. ‘But the original researchers, before the war, must have known what they were doing. Mustn’t they?’

Mark said, ‘Not necessarily. After all, if they’d been able to figure out Xeelee technology, maybe they wouldn’t have lost the war—’

‘Shut up, Mark,’ Louise said mildly. ‘Now, Spinner. Listen carefully. You have three waldoes - three boxes. We believe - we *think* - the one directly in front of you is interfaced to the hyperdrive control, and the two to your sides connect to the intraSystem drive.’

‘IntraSystem?’

‘Sublight propulsion, to let you travel around the Solar System. All right? Now, Spinner, today we aren’t going to touch the hyperdrive - in fact, that waldo is disabled. We just want to see what we can make of the intraSystem drive. All right?’

‘Yes.’ Spinner looked at the two boxes; the touch-pad lights glowed steadily, in reassuring colours of yellow and green.

‘On your left hand waldo you’ll see a yellow pad. It should be illuminated. See it?’

‘Yes.’

Louise hesitated. ‘Spinner, try to be ready. We don’t know what to expect. There might be *changes* . . .’

‘I’m ready.’

‘Touch the yellow pad - once, and as briefly as you can . . .’

Spinner tried to put aside her fear. She lifted her hand—

Spinner-of-Rope. Don’t be afraid.

Startled, she twisted in her couch.

It had been a dry, weary voice - a *man’s* voice, sounding from somewhere inside her helmet.

Of course, she was alone in the cage.

It’s just a *machine,* the voice said now. *There’s nothing to fear . . .*

She thought, *Lethe. What now? Am I going crazy?*

But, strangely, the voice - the sense of some invisible presence, here in the cage with her - was somehow *comforting.*

Spinner held her right hand over the waldo. She pressed her gloved finger to the yellow light.

A subtle change in the light, around her. There was no noise, no sense of motion.

She glanced down, through the bars of her cage.

The ice was gone. *Callisto had vanished.*

She twisted in her seat, the straps chafing against her chest, and peered out of her cage. The rings of Jupiter and the Sun's swollen form covered the sky - unperturbed by the disappearance of a mere moon. She couldn't see the *Northern.*

She spotted a ball of ice, small enough to cover with her fist, off to her right, below the nightfighter.

Could that be Callisto? If so, she'd travelled thousands of miles from the moon, in less than a heartbeat - and felt nothing.

She looked behind her.

The Xeelee nightfighter had *spread* its sycamore-seed wings. From within their hundred-yard shells, sheets of night-darkness - *hundreds of miles long* - curled across space behind her, occluding the stars.

At her touch, the ancient Xeelee craft had come to life.

She screamed and buried her faceplate in her gloves.

Lieserl soared out from the core, out through the shell of fusing hydrogen, and inspected her maser convection loops. She sensed the distorted echoes of her last set of messages, as they had survived their cycles through the coherence paths of the convection loops.

She adjusted the information content of her maser links, and initiated new messages. She added in the latest information she'd gleaned, and restated - in as strong and simple a language as she could muster - her warnings about the likely future evolution of the Sun.

When she was done, she felt something within her relax. Once more she'd scratched this itch to communicate; once more she'd assuaged her absurd, ancient feelings of guilt . . .

But it was only after she'd sent her communication that she studied, properly, the cycled remnants of her last signals.

She allowed the maser bursts to play over her again. The messages had *changed* - and this time it wasn't simple degradation. How was this possible? Some unknown physical process at the surface of the red giant, perhaps? Or - she speculated, her excitement growing as she began to see traces of structure within the changes - or was there someone *outside:* someone still alive, and recognizably human - and trying to talk to her?

Feverishly she devoured the thin information stream contained in the maser bursts.

Fifty thousand miles from Callisto, pods from the *Northern* hung in a rough sphere. At the centre of the sphere, the magnificent wings of the Xeelee ship remained unfurled, darkly shimmering - almost alive.

Spinner sat with Louise within the safe, enclosing glass walls of a pod. Louise, with a touch on the little control console before her, guided the pod around the Xeelee nightfighter; neighbouring pods slid across space, bubbles of light and warmth. The wings were immense sculptures in space, black on black. Spinner could hear Mark whispering in Louise's ear, and numbers and schematics rolled across a data slate on Louise's lap.

Spinner's faceplate dangled at her back, and she relished the feel of fresh air against her face. It was *wonderful* simply not to breathe in her own stale exhalations.

She'd dug her father's arrow-head out of her suit so that it dangled at her chest; she fingered it, rubbing her hands compulsively over its smooth lines.

Louise glanced at Spinner. 'Are you all right now?' She sounded apologetic. 'Mark got to you as quickly as he could. And—'

Spinner-of-Rope nodded, curtly. 'I wasn't hurt.'

'No.' Louise glanced down at her slate again; her attention was clearly on the data streaming in about the activated nightfighter. She murmured, 'No, you did fine.'

'Yeah,' Spinner grunted. 'Well, I hope it was worth it.'

Louise looked up from her slate. 'It *was*. Believe me, Spinner; even if it might be hard for you to see how. The very fact that you weren't harmed, physically, by that little jaunt has told us volumes.'

Now Mark's voice sounded in the air, 'You travelled tens of thousands of miles in a fraction of a second, Spinner. You should have been *creamed* against the bars of that cage. Instead, something protected you . . .'

Louise looked at Spinner. 'He has a way of putting things, doesn't he?'

They laughed together. Spinner felt a little of the numbness chip away from her.

'Mark's right,' Louise said. 'Thanks to you, we're learning at a fantastic rate about the nightfighter. We know we can use it without killing ourselves, for a start . . . And, Spinner, understanding is the key to turning *anything* from a threat into an opportunity.'

Louise took the pod on a wide arc around the unfurled wings of the Xeelee craft. The wings were like a star-free hole cut out of space, beneath Spinner-of-Rope; they retained the general sycamore-seed shape of the construction-material framework, but were vastly extended. Spinner could see ‘bots toiling patiently across the wings’ surface.

‘This far out, the mass-energy of the wing system is actually attracting the pod, gravitationally,’ Louise murmured. ‘The wings have the mass equivalent of a small asteroid . . . I can see from my slate that the pod’s systems are having to correct for the wings’ perturbation.

‘Let’s go in a little way.’

She took the pod on a low, sweeping curve over the lip of one wing and down towards its surface. The wing, a hundred miles across, was spread out beneath Spinner like the skin of some dark world; the little pod skimmed steadily over the black landscape.

Louise kept talking. ‘The wing is *thin* - as far as we can tell its thickness is just a Planck length, the shortest distance possible. It has an extremely high surface tension - or, equivalently, a high surface energy density - so high, in fact, that its gravitational field is inherently non-Newtonian; it’s actually *relativistic* . . . Is this making any sense to you, Spinner?’

Spinner said nothing.

Louise said, ‘Look: from a long way away, the pod was attracted to the wings, just as if they were composed of normal matter. *But they’re not*. And, this close, I can detect the difference.’

She drew the pod to a stop, and allowed it to descend, slowly, towards the wing surface.

Spinner, gazing down, couldn’t tell how far away the night-black, featureless floor was. Was Louise intending to land there?

The pod’s descent slowed.

Louise, working her control console, caused the pod’s small vernier rockets to squirt, once, twice, sending them down towards the wing surface once more. But again the pod slowed; it gradually drifted to a halt, then, slowly, began to rise, as if rebounding.

Louise’s face was alive with excitement. ‘Spinner, could you feel that? Do you see what’s happening? This close, the wing surface is actually gravitationally *repulsive*. It’s pushing us away!’

Spinner eyed her. ‘I know you, Louise. You’ve already figured out how a discontinuity drive would work. You were *expecting* this antigravity stunt, weren’t you?’

Louise smiled and waved a hand at the Xeelee craft. ‘Well, okay. Maybe I made a few educated guesses. This ship isn’t magic. Not even this antigravity effect. It’s all just an exercise in high physics. Of course we couldn’t *build* one of these.’ Her eyes looked remote. ‘Not yet, anyway . . .’

‘Tell me how it works, Louise.’

At extremes of temperature and pressure, spacetime became highly symmetrical (Louise told Spinner). The fundamental forces of physics became unified into a single superforce.

When conditions became less intense the symmetries were broken. The forces of physics - gravity, nuclear, electromagnetic - froze out of the superforce.

‘Now,’ Louise said, ‘think of ice freezing out of water. Think back to what we saw on Callisto - all those flaws inside the ice, remember? The freezing of water doesn’t happen in an even, symmetrical way. There are usually *defects* - discontinuities in the ice.

‘And in just the same way, when physical forces freeze out of the unified state, there can be defects - but now, these are defects in spacetime itself.’

Space was three-dimensional. Three types of stable defects were possible: in zero, one or two dimensions. The defects were points - *monopoles* - or lines - *cosmic strings* - or planes - *domain walls.*

The defects were genuine flaws in spacetime. Within the defects were sheets - or points, or lines - of *false vacuum:* places where the conditions of the high-density, symmetrical, unified state still held - like sheets of liquid water trapped within ice.

‘These things can form naturally,’ Louise said. ‘In fact, possibly many of them did, as the Universe expanded out of the Big Bang. And maybe,’ she went on slowly, ‘the defects can be manufactured artificially, too.’

Spinner stared out of the pod at the nightfighter. ‘Are you saying—’

‘I’m saying that the Xeelee can create, and control, spacetime defects. We think that the “wings” of this nightfighter are defects - domain walls, bounded about by loops of cosmic string.

‘Spinner-of-Rope, the Xeelee use sheets of antigravity to drive their spacecraft . . .’

The domain walls were inherently unstable; left to themselves they would decay away in bursts of gravitational radiation, and would attempt to propagate away at speeds close to that of light. The Xeelee nightfighter must actually be stabilizing the flaws, actively, to prevent this happening, and then destabilizing the flaws to gain propulsion.

Louise believed the Xeelee’s control of the domain-wall antigravity effect must be behind the ship’s ability to shield the pilot cage from acceleration effects.

‘All this sounds impossible,’ Spinner said.

‘There’s no such word,’ Louise said aggressively. ‘Your trip was a real achievement. ’ Louise, clearly excited by the Xeelee’s engineering prowess, sounded as alive and full of enthusiasm as Spinner had ever heard her. ‘You gave us the first big break we’ve made in understanding how this nightfighter operates - and, more significantly, how we can use it without destroying ourselves.’

Spinner frowned. ‘And is that so important?’

Louise looked at her seriously. ‘Spinner, I need to talk this out properly with you. But I suspect how well we use this nightfighter is going to determine whether we - the human species - survive, or perish here with our Sun.’

Spinner gazed out at the Xeelee craft, at the scores of drone ‘bots which clambered busily across the face of its wings.

Perhaps Louise was right; perhaps understanding how something worked *did* make it genuinely less threatening. The Xeelee nightfighter wasn’t a monster. It was a tool - a resource, for humans to exploit.

‘All right,’ she said. ‘What next?’

Louise grinned. ‘Next, I think it’s time to figure out how to take this nightfighter on a little test jaunt around the Solar System. I’d like to see what in Lethe happened here. And,’ she said, her face hardening, ‘I want to know what’s happening to our Sun . . .’

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18

Milpitas put down his pen.

Annoyingly, it drifted away from the surface of his desk and up into the air, cart-wheeling slowly; Milpitas swiftly scooped up the offending item and swept it into a drawer, where it could drift about to its little insensate heart's content.

He climbed stiffly from his chair and made his slow way from the office.

Fine white ropes had been strung out along the Temple's warren of corridors. By judiciously sliding one's closed fists along the rope, one could quite easily maintain the illusion - for oneself and others - of walking, as normal. He passed another Planner, a junior woman with her tall, shaven dome of a scalp quite gracefully formed. Her legs were hidden by a long robe, so that - at first glance anyway - it could have been that she *was* walking. Milpitas smiled at the girl, and she nodded gravely to him as they passed.

Excellent, he thought. That was the way to deal with this ghastly, offensive situation of zero-gee, of course: by not accepting its reality, by allowing no intrusion into the normal course of things - into the usual, smooth running of their minds. By such means they could survive until gravity was restored. He moved through the corridors of his Temple, past Planner offices which had been hastily adapted to serve as dormitories and food stores. Beyond the closed doors he heard the slow, subdued murmur of the voices of his people, and beyond the Temple walls there continued the steady, sad wailing of the klaxon.

He worked his way out from the bowels of the building, out towards the glistening skin of the Temple. He had conducted an inspection tour like this every shift since the start of the emergency. His assistants formed a complex web of intelligence throughout the Temple, of course, and reports were ready for him whenever he requested them. Some contact had even been maintained with the other Temples, thanks to carefully selected runners. But, despite all that data, Milpitas still found there was no substitute for getting out of his office and *seeing* for himself what was going on.

And, he flattered himself to think, perhaps it comforted the people - the lost children he'd gathered here into his protection, in the midst of this, their

greatest crisis - to be aware that he, Milpitas, their Planner, was among them.

But, he thought, what if gravity were never returned?

He pulled at his chin, his fingernails lingering on the network of AS scars they found there.

They would have to adjust. It was as simple as that. He evolved vague schemes for stringing networks of ropes across the Decks; there was really no reason why normal life - at least, a close semblance of it - should not resume.

The discipline of the Planners had already persisted for almost a thousand years. Surely a little local difficulty with the gravity wasn't going to make any difference to that.

Still, he thought, some events - however unwelcome - *did* force themselves into one's awareness. Such as the moment when the gravity had died. Milpitas remembered clinging to his own chair, watching in horror as the artifacts on his desk - the ordinary, humdrum impedimenta of everyday life - drifted away into the treacherous air.

In the Decks, there had been panic.

Milpitas had sounded the klaxon - and it still sounded now - calling the people to him, to the protection of the Temple.

Slowly, one by one, or in little groups clinging to each other fearfully, they had come to him. He had lodged them in offices, giving them the security of four stout walls about them.

People had been stranded helplessly in mid-air. Ropes had been slung between the Decks, huge nets pulled through the air to gather in the flopping human fish. All of them had been brought to him, some almost catatonic with fear, their old-young faces rigid and white.

He reached the tetrahedral outer hull of the Temple. The skin was a wall of golden glass which inclined gracefully over him, softening the harsh light of the Decks; the wall's framework cast long, soft-edged shadows across the outer corridors.

. . . But the light, today, had changed, he noticed now. He glanced up, quickly, above his head. Shafts of grey Deck daylight, raw and unfiltered, came seeping through holes in the golden wall. At each gap in the wall a sentry hovered, fixed to the glass wall by a loose sling of rope.

The holes had been punched out, in the last few minutes or hours, by the sentries; they must have seen someone, somehow, approaching the Temple.

The nearest sentry glanced down at Milpitas' approach. It was a woman, Milpitas saw; she held her cross-bow up against her chest, nervously.

He smiled at her and waved. Then, as soon as he felt he could, he dropped his eyes and moved on.

Damn. His composure, the gestalt of his mood, had been quite disrupted by the sight of the sentries and the knocked-out glass panes. Of course he himself had posted the sentries up there as a precaution (a precaution against *what*, he hadn't cared to speculate). He'd really hoped that the sentries wouldn't need to be used, that no more irruptions from *outside* would occur.

Evidently that hope hadn't yet been fulfilled. His plans to repopulate the Decks would have to be postponed for a while longer.

Well, there was still food and other essentials, here in the Temples. And when the supplies ran out, their AS nanobots could preserve them all for a long while; the nanobots would enable each antique human body to consume its own resources, digging deeper and deeper, to preserve the most vital functions.

And even the failure of *that* last fallback would, in the end, be irrelevant, of course.

The people would remain with him, Planner Milpitas, here in the Temple. Where they were safe. He had to protect the future of the species. That was his mission: a mission he had followed unswervingly for centuries. He had no intention of abandoning his duty to his charges now.

Not even if it meant keeping them in here forever.

The wings of the nightfighter loomed over the battered surface of Port Sol.

The relativistic effects of the flight - intense blue shift ahead, the hint of a starbow girdling the sky - faded rapidly from Spinner's sensorium. The Universe beyond her cage of construction material assumed its normal aspect, with the wizened stars scattered uniformly around the sky, and the blood-red bulk of the Sun an immense, brooding presence.

She took her hands from the control waldoes and lay back in her couch. She closed aching eyes, and tried to still the trembling in her hands.

She sucked apple-juice from the nipple inside her helmet. The juice tasted slightly odd - as usual, because of the nutrient supplements that had been added to it. Her legs and back felt stiff, her muscles like bits of wood, after two days in this box. The plumbing equipment she'd been fitted with was chafing again, and somewhere under her back there was a fold of cloth in her suit, a fold which dug enthusiastically into her flesh. Even the loop of rope at her waist felt tight, restricting.

'Spinner-of-Rope. Can you hear me?' It was Louise's voice, calling from the cosy shirtsleeve environment inside the life-lounge she'd fixed to the shoulders of the nightfighter. 'Are you all right?'

Spinner sighed. 'About as all right as you'd expect me to be.' She clenched her hands together and worked her fingers through the thickness of the gloves' material, trying to loosen up the muscles. Over-tension in her hands was probably going to be her biggest problem, she reflected. Her guidance of the ship was assisted by the processing power Louise had had installed inside the life-lounge, but still, and quite frequently, Spinner had to supply manual intervention.

'Spinner, do you want to close up the wings?'

Spinner stabbed at a button on the left-hand waldo. She didn't bother to look back to watch the controlled defects in spacetime heal themselves over; without the wings, the quality of light in the cabin changed a little, brightening.

'Okay. Would you like to come into the lounge for a while?'

Another damn spacewalk? She closed her eyes; her eyeballs prickled with fatigue. 'No thanks, Louise.'

'You've been in that couch for thirty-six hours already, Spinner. You need to be careful with yourself.'

'What are you worried about?' Spinner asked sourly. 'Bed-sores?'

'No,' Louise said calmly. 'No, the safety of the nightfighter . . .'

Spinner had quickly learned that journey times in the 'fighter were going to be *long*. Louise had worked out that the nightfighter's discontinuity drive could bring it to better than half lightspeed. Terrific. But most of the Solar System was empty space. It was a big place. During a 'fighter journey, little would change visibly, even from hour to hour - but that served to make the *worst* moments, when she came plummeting at

some planet or moon, even more terrifying, with their sensations of such intense *speed.*

Spinner had felt no acceleration effects, and Louise assured her that her suit - and the action of the construction material cage around her- would protect her from any hard radiation, or heavy particles she might encounter . . . But still, she was forced to sit in this damn box, and watch the stars blue-shift towards her.

Maybe the Xeelee had never suffered from vertigo, but she'd quickly found that *she* sure did.

'Well, here we are at Port Sol. Louise, how long do you want to stay here?'

Louise hesitated. 'Not long, I don't think. I didn't expect to find anything here, and now that I'm here I still don't.'

'Then I'll stay in the pod. The sooner we can get away, the more comfortable I'll feel.'

'All right. I accept that. Spinner-of-Rope, tell me what you see.'

Spinner opened her eyes, with some reluctance, and looked beyond the construction material cage.

In contrast to the crowded sky of the ruins of the Jovian system, there was *emptiness* here.

The Sun was a ball of dull red, below the cage and to her right. Even here, on the rim of the System, Sol still showed a large disc, and sent bloody light slanting up through her cage.

To her left the worldlet Louise called Port Sol rotated, slowly. The little ice moon was scarred by hundreds of craters: deep, surprisingly regular. The tiny moon had supplied the ancient interstellar GUTships with ice for reaction mass. There were still buildings here, tight communities of them all over the surface; Spinner could see the remnants of domes, pylons and arches, spectacular microgravity architecture which must have been absurdly expensive to maintain.

But the buildings were closed, darkened, and thin frost coated their surfaces; the pylons and graceful domes were collapsed, with bits of glass and metal jutting like snapped bones.

'I recognize some of this,' Louise said. 'Some of the geography, I mean. I could even tell you place names. Can you believe that - after five megayears?

‘ . . . But I guess that’s just telling us that Port Sol was abandoned not long after my time. Once the Squeem hyperdrive was acquired, the GUTship lines - even the wormhole route operators - must have become suddenly obsolete. There was no longer any economic logic to sustain Port Sol. I wonder what the last days were like . . . Perhaps the Port was kept going by tourism, for a while. And, thinking back, there would have been a few who wouldn’t want to return to the crowded pit of the inner System. Perhaps some of them stayed here until their AS treatment finally failed them . . .

‘Maybe that’s how it was,’ she said. ‘But I think I’d rather imagine they closed the place up with one *major* party.’

‘How did Port Sol survive the wars?’

‘Who would want to come here?’ Louise said dryly. ‘What is there to fight over? There’s nothing that’s even worth *destroying*. Spinner, Port Sol must have been abandoned for most of the five megayears since the *Northern*’s departure. It’s drifted around the rim of the System, unremarked and never visited, while the tides of the Xeelee wars washed over the inner worlds. The System is probably littered with sites like this - abandoned, too remote to be worth tracking down for study, or exploitation, or even to destroy. All encrusted with bits of human history - and lost lives, and bones.’

Spinner laughed uneasily; she wasn’t used to such reflection from the engineer.

She twisted her head, looking around the sky. ‘I don’t like it here, Louise,’ she said. ‘It’s *barren*. Abandoned. I thought the Jupiter system was bad, but—’

Apart from the Sun and Port Sol, only the distant, dimmed stars shone here, impossibly remote. Spinner felt cowed by the dingy immensity all around her: she felt that her own spark of human life and warmth was as insignificant against all this darkness as the dim glow of the touchpad lights on her waldoes.

Empty. Barren. These were the true conditions of the Universe, she thought; life, and variety, and energy, were isolated aberrations. The *Northern* forest-Deck - the whole of that enclosed world which had seemed so huge to her, as a child - was nothing but a remote scrap of incongruous green, irrelevant in all this emptiness.

Louise said, ‘I know how you’re feeling. At least at Jupiter there was something in the sky. Right? Listen to me, Spinner; it’s all a question of *scale*. Port Sol is a Kuiper object - a ball of ice travelling around the Sun about fifty AUs out. AUs - astronomical units - that means—’

‘I know what it means.’

‘Spinner, Jupiter is only *five* AUs from the centre of the Sun. So we’re ten times further out from the heart of the System than *Northern* is . . . so far out that we’re on the edge of the Solar System, so far that the other bodies in the System - save Sol itself - are reduced to points of light, invisible without enhancement. Spinner, emptiness is what you have to expect, out here.’

‘Sure. So tell me how it makes *you* feel.’

Louise hesitated. ‘Spinner-of-Rope, five million years ago I came here to work - in the old days, while the *Great Northern* was being constructed . . .’

Louise spoke of bustling, sprawling, vigorous human communities nestling among the ancient ice-spires of the Kuiper object. The sky had been full of GUTships and stars, with Sol a bright yellow gleam in Capricorn.

‘But now,’ Louise said, her voice tight, ‘look at the Sun . . . Spinner-of-Rope, even from this far out - even from fifty AUs - the damn thing is twice as wide as the Moon, seen from old Earth. It’s *obscene* to me. It makes it impossible for me to forget, even for a moment, what’s been done.’

Spinner sat silently for a moment. Memories of Earth meant nothing to her, but she could feel the pain in Louise’s voice.

‘Louise, do you want to land here?’

‘No. There’s nothing for us down there . . . It was only an impulse that brought me out here in the first place; we had no evidence that anything had survived. I’m sorry, Spinner.’

Spinner sighed. ‘Where to now?’

‘Well, since we’re out here in the dark, let’s stay out. We’re still picking up that remote beacon.’

‘Where’s the signal coming from?’

‘Further out than we are now - about a hundred AUs - *and* a goodly distance around the equatorial plane from Port Sol. Spinner-of-Rope, we’re looking at another few days in the saddle, for you. Can you stand it?’

Spinner sighed. ‘It’s not getting any easier. But it’s not going to get any worse, is it?’ . . . And, she thought, it wasn’t as if the base they had established amid the ruins of the Jupiter system was so fantastically inviting a place to get back to. ‘Let’s get it over.’

‘All right. I’ve already laid in your course . . .’

There could be no true dialogue, Garry Uvarov thought, between Lieserl - the strange, lonely exile in the Sun - and the crew of the returned *Great Northern.*

The corpse of Jupiter was only just over a light-hour from the centre of the Sol-giant, but Lieserl’s maser messages took far longer than that to percolate out of the Sun along the flanks of their immense convection cells. So communications round-trips - between the *Northern* and the antiquated wormhole terminus that supported Lieserl’s awareness - took several days.

Still, once contact was established, a prodigious amount of information flowed, asynchronously, back and forth across the tenuous link.

‘Incredible,’ Mark murmured. ‘She dates from our own era - she was placed within the Sun at almost exactly the same time as our launch.’

It sounded as if Mark were speaking from somewhere inside Uvarov’s own head. Uvarov swivelled his sightless face about the dining saloon. ‘You’re forgetting your spatial focus again,’ he snapped. ‘I know you’re excited, but—’

There was a soft concussion; Uvarov pictured Virtual sound-sources reconfiguring throughout the saloon. ‘Sorry,’ Mark said, from a point in the air a few feet before Uvarov’s head.

‘As far as I can tell, she’s human,’ Mark said. ‘A human analogue, anyway. The woman’s been in there, alone, *for five million years*, Uvarov. I know that subjectively she won’t have endured all that time at a normal human pace, but still . . .

‘She’s another Paradoxa project - just as we are. Which is why there’s such a coincidence in dates. We must both date from Paradoxa’s most active period, Uvarov.’

Uvarov smiled. ‘Perhaps. And yet, what has resulted of all the grand designs of those days? Paradoxa was planning to adjust the future of mankind - to ensure the success of the species. But what is the outcome? We have: one half-insane relic of a woman-Virtual, wandering about inside the Sun, one broken-down GUTship, the *Northern* . . . and a Sun become a

giant in a lifeless Solar System.' He worked his numb mouth, but there was no phlegm to spit. 'Hardly a triumph. So much for the abilities of humans to manage projects on such timescales. So much for Paradoxa!'

'But Lieserl has followed a lot of the history of the human race - in patches, and from a distance, but she knows more than we could ever hope to have uncovered otherwise. She lost contact with the rest of the race only as humans entered a late period called the Assimilation, when mankind was moving into direct competition with the Xeelee.'

Uvarov couldn't wrench his imagination away from the plight of Lieserl. 'But, I wonder, are these few, pathetic scraps of data sufficient compensation for a hundred thousand lifetimes of solitude endured by this unfortunate *Lieserl*, in the heart of a dying star?'

Mark synthesized a sniff. 'I don't know,' he said frankly. 'Maybe you're a better philosopher than I am, Uvarov; maybe you can come to judgements on the moral value of data. At this moment I don't really *care* where this information has come from.'

'No,' Uvarov said. 'I don't suppose you do.'

'I'm simply grateful that, because Lieserl exists, we've managed to learn something of humanity's five-megayear past . . . *and* of the photino birds.'

'*Photino birds*?'

The timbre of Mark's voice changed; Uvarov imagined his stupid, pixel-lumped face splitting into a grin. 'That's Lieserl's phrase. She found what she was sent in to find - dark matter energy flows, sucking the energy out of the core of the Sun. But it wasn't some inanimate process, as her designers had expected: Lieserl found *life*, Uvarov. She's not alone. She's surrounded by photino birds. And I think she rather enjoys the company . . .'

'*Lieserl* . . . ' Uvarov rolled the name around his mouth, savouring its strangeness. 'An unusual name, even a thousand years ago.' Uvarov's patchy, unreliable memory fired random facts into his tired forebrain. 'Einstein had a child called Lieserl. I mean Albert Einstein, the—'

'I know who he was.'

'His wife was called Mileva,' Uvarov said. 'Why do I remember this? . . . They bore a child, Lieserl - but out of wedlock: a source of great shame in the early twentieth century, I understand. The child was adopted. Einstein

had to choose between his child, and his career in science . . . all that beautiful science of his. What a choice for any human to have to make!

‘So this woman has the name of a bastard,’ he said. ‘A name redolent of isolation. How appropriate. How *lonely* she must have been . . .

‘And now she enjoys the company of dark matter life forms,’ he mused. ‘I wonder if she still remembers she was once *human*.’

Port Sol was twenty light-hours from the source of the beacon, Louise estimated. The nightfighter would be able to complete the trip in fifty hours.

Spinner-of-Rope, working her rudimentary controls with growing confidence, opened up the sail-wings of the nightfighter. She glanced over her shoulder to watch the wings. Her view was partially obscured by Louise’s life-lounge, an improvised encrustation which sat, squat, on the thick construction material shoulders of the ship’s wing-mountings, just behind her own cage. One of the *Northern*’s small, glass-walled pods had been fixed there too.

The nightfighter used its domain wall antigravity effect to protect the lounge, with Louise in it, from its extremes of acceleration. After a lot of experimentation they had found that securely attaching the lounge, and other artifacts, to the structure of the Xeelee nightfighter was enough to fool the craft into treating the enhancements as part of its structure.

But still, despite the human obstructions, Spinner could see the sparkle of the cosmic-string rims of the wings as they wound out across hundreds of miles of space, hauling open the night-blackness of the domain wall wings themselves. As they unfurled, the wings curved over on themselves with a grace and delicacy astonishing, Spinner thought, in artifacts so huge - and yet those curves seemed imbued with a terrific sense of vigour, of power.

She touched the waldoes.

The wings pulsed, once.

There was an instant in which she could see Port Sol recede from her, a flashbulb impression of squat human buildings and gaping ice-wounds which imploded to a light-point with a terrifying, helpless velocity.

And then the worldlet was gone. Within a heartbeat, Port Sol had become too dim even to show up as a point - and there was no longer a frame of reference against which she could judge her speed.

Then, with slow sureness as her speed built up, blue shift began to stain the stars ahead of her once more. For a few hours relativistic effects would

spuriously restore those aged lights to something like the brilliance they had once enjoyed.

. . . And again she had the sense, almost undefinable, of someone *here* with her, inside the cage - a presence, surely human, staring out wistfully at the blue-shifted stars as she did.

She wondered whether she should tell Louise about this. But - real or not, external to her own, fuddled mind or not - her companion wasn't *threatening.*

And besides, what would Louise make of it? What could she do about it?

As the starbow coalesced around her once more, Spinner-of-Rope opaqued her faceplate, wriggled in her couch until an irritating wrinkle of cloth behind her back had smoothed itself out, and tried to sleep.

The slow, wide orbits of Port Sol and the beacon source had left them ninety degrees apart, as seen from the centre of the Sun. Louise had laid in a course which took the nightfighter on a wide, high trajectory high above the plane of the System, arcing across its outer regions. The nightfighter's path was like a fly hopping across a plate, from one point on the plate's rim to another.

The Sun sat like a bloated, grotesque spider at the heart of its ruined System. All of the inner planets - Mercury, Venus, Earth/Luna - were gone . . . save only Mars, which had been reduced to a scorched cinder, surely barren of life, its orbit taking it skimming through the outer layers of the new red giant itself.

In a few more millennia that fragile orbit would erode, pitching Mars, too, into the flames.

Of the outer gas giants - Jupiter, Saturn, Uranus, Neptune - all had survived with little change, save imploded Jupiter. But the outermost planet of all - the double world Pluto/Charon - had disappeared.

Spinner listened to Louise describe all this. 'So where did Pluto go?'

'I've no idea,' Louise said. 'There's not a trace to be seen, anywhere along its old orbital path. Maybe we'll never know.

'Spinner, a lot of the minor bodies of the System seem to have taken a real beating. Some of that is no doubt due to the Sun's new, extreme state . . . but maybe some of it has been deliberate, too.'

Once, the Solar System had served as host to billions of minor bodies The Oort-Opik Cloud was - had once been - a swarm of a hundred billion comets circling through an immense, sparse shell of space, between four light-months and three light-years from the Sun. Now, that cloud was denuded.

Louise said, ‘Many of the comets must have been destroyed by the growth of the Sun - flashed to steam by its huge outpouring of heat energy, in one last, extravagant fling . . . They would have been visible from other systems, actually; they’d have inserted water lines, briefly, in the spectrum of the Sun: a kind of spectral Last Post for the Solar System, if there was anybody left, anywhere, to see.’

Further in towards the Sun, there were the Kuiper objects, like Port Sol: icy worldlets, orbiting not far outside the widest planetary orbits. And throughout the System there were more rings of small objects - like the asteroids, shepherded into semi-stable orbits by the gravitational interaction of the major planets.

‘But *all* those worldlet rings are depleted,’ Louise said. ‘Now, some of that depletion must be due to the Sun’s forced evolution, not to mention the loss of three of the inner planets. But many of the small objects *must* have been populated, by the era of the Xeelee wars.’

‘So the objects might have been deliberately destroyed - more casualties of war.’

‘Right.’

Spinner swilled apple-juice around her mouth, wishing she had some way to spit it out - or better still, to clean her teeth.

Spinner had learned of the Solar System only through Louise’s bookslates and records, but she’d gained an impression of an immense, bustling, prosperous world-system. There had been huge orbital habitat-cities, heavily populated worlds laced together by wormhole transit routes, and ships like immense, extravagant diamonds crossing the face of the yellow-gold Sun. Somewhere inside her - despite all the dire warnings of Paradoxa - she’d hoped to arrive here and find it all just as she’d read.

Instead, there was only this decayed Sun and its ruined worlds . . . even the wormhole routes, it seemed, had been shut down. And here *she* was, stuck inside the pilot-cage of an alien craft, chasing across tens of billions of miles in search of one, sad, isolated beacon.

She began to take her body through a simple regime of callisthenics, exercises she could get through without climbing out of her couch. ‘So, Louise. You’re telling me that Sol is dead. The System is dead. And you sound . . . upset about it. But what else did you expect to find?’

‘I expected nothing. I *hoped* for more,’ Louise said. ‘But I guess the slow destruction of the Sun, coupled with the Xeelee assaults, were together enough to wipe the System clean . . .’

Spinner felt, suddenly, profoundly depressed, as if the weight of all those lost years, those hundreds of billions of lives which had resulted in nothing but this cosmic rubble, was bearing down on her.

‘Louise, I don’t want to hear any more.’

‘All right, Spinner. I—’

Spinner shut her off.

She blanked out her faceplate, and filled its inner side with a soothing, cool green light, the light which had filtered through leaves from an artificial Sun to illuminate her childhood. She immersed herself in the warm feel of her muscles, as she pushed through her exercises.

Immersed in the cries of the klaxon, Morrow’s party held a council of war.

‘I’ve been scouting,’ Mark said. ‘And as far as I can tell it’s the same all over the Decks. No people, anywhere. The same emptiness . . . Everyone has been taken into the Temples. And it’s not going to be easy to get them out.’

‘Let’s leave them in there, then,’ Trapper-of-Frogs said practically. ‘If that’s what they want.’

Morrow studied her round, unmarked face. ‘Unfortunately, that isn’t an option,’ he said gently. ‘We have to protect them.’

‘From themselves?’

‘If necessary, yes. At any rate, from the Paradoxa Planners.’

Trapper thrust her face up at his. ‘Why?’

Morrow started to feel impatient. ‘Because we have to. Look, Trapper, I didn’t want to come on this jaunt into the Decks any more than you did. It’s not my fault we’re being shot at—’

‘Starve them,’ Trapper said simply.

Morrow turned to her. ‘What?’

‘Starve them.’ She turned to study the Temple with an appraising eye, as if assessing its capacity. There must be hundreds of people in there - and in the other Temples. They can’t have that much food and water; there just isn’t room in there. I say we wait here, until they get starved out. Simple.’

Constancy-of-Purpose grinned, maliciously. ‘We could block the sewage outlets. I know where the outlets are; it would be easy. That would be fun. And a lot faster acting.’

Mark hovered before her, his artificial face drawn into stern disapproval. ‘And cause plague, illness and death on a massive scale? Is that really what you’re proposing?’

Constancy-of-Purpose looked doubtful; she passed a massive hand over her scalp.

‘Listen to me,’ Mark said slowly. ‘This is my field - I’m a socio-engineer, after all. Was, whatever. The last thing we want is a siege, here. Do you understand? I’m not sure if we have the resources to break a siege. If we tried, the fall-out - the illness and death - would put an immense strain on the *Northern*’s infrastructure.

‘Besides—’ He hesitated.

Morrow said, ‘Yes?’

‘Besides, I’m not certain that breaking a siege is even *possible*.’

‘What do you mean?’

‘Look: the Planners see themselves as messianic. They, and only they, can save “their” people. If we besiege them, the Planners simply won’t respond the way a rational person would - by studying their resources, by assessing the chances of a successful break-out, and so on. Worse still, we - the besiegers - would become part of the fabric of their delusion, an embodiment of the external threats which assail their people.’

Morrow frowned. ‘I don’t understand.’

Mark, evidently forgetting there was no drive-induced gravity, started pacing around the Deck, his Virtual feet soundlessly missing the floor by a fraction of an inch. ‘You have to understand things from the point of view of the people in control in there: *the Planners*.’ He turned a frank gaze on Morrow. ‘I’ve been studying you, Morrow. I know you’re still intimidated - by this place, by the nearness of the Planners. Aren’t you? - despite all your experiences outside here, beyond these walls.’

Morrow said nothing.

‘This culture has a lot of power,’ Mark said. ‘Almost all of it is concentrated in the hands of the Planners, with the mass of people dumbly acquiescing. Morrow, the Planners have taken the species-survival logic of Paradoxa - the logic which lay behind the whole of the *Northern*’s mission, after all - and extrapolated it into something more - something almost religious.

‘We’re dealing with a powerful concept, folks; one that seems to touch buttons wired deep into our human psyches. People on these Decks have followed where the Planners have led for nearly a millennium - including you, Morrow.

‘When Louise and I saw this tendency developing, quite early in the flight, we decided we couldn’t overcome it - and it would be wastefully destructive to try.

‘So we withdrew, to the *Great Britain*, leaving enough of a physical control infrastructure in place for us to ensure the ship could run smoothly.

‘Well, maybe we were wrong to do that; because now the Planners’ messiah complex is leading us to a crisis . . .’

Morrow found he intensely disliked being analysed in this way by a Virtual construct. ‘But what are we to *do*?’ he snapped. ‘How are we to use these staggering insights of yours?’

‘The situation is unpredictable,’ Mark said bluntly. ‘But it’s possible that the Planners would *destroy* their people - and themselves - rather than let us win.’

The little party exchanged shocked glances.

Trapper said, ‘But that’s *insane*. It even contradicts their conscious goals - to protect their people.’

Mark’s smile was thin. ‘Nobody said it had to make sense. Unfortunately, there are plenty of precedents, right through human history.’

Constancy-of-Purpose said, ‘With flaws like that hard-wired into our heads, it’s a wonder we ever got into space in the first place.’ She let herself drift a little way from the Deck, her legs dangling beneath her, and studied the Temple, eyes squinting. ‘Well, if we can’t break the siege, we’re going to have trouble. For a start, there are more of them than us. And, second, their cross-bows have a much greater range than these blowpipes wielded by Trapper and her friends—’

‘Maybe,’ Trapper-of-Frogs said slowly, ‘but I’ve been thinking about that. I mean, the Planners could have killed us earlier, when we were strung out along the Deck. Couldn’t they?’

Mark frowned. ‘They fired *over* us. Maybe they were trying to warn us.’

‘Maybe.’ Trapper-of-Frogs nodded grudgingly. ‘Or maybe they *were* trying to hit us - but couldn’t. Watch this.’

She pulled a dart from the pouch at her waist and raised her blowpipe to her lips. She spat the dart harmlessly into the air, on a flat trajectory parallel to the Deck.

Morrow, bemused, tracked the little projectile. It rapidly lost most of its initial speed to the resistance of the air, but its path continued flat and even, still parallel to the Deck. Eventually, Morrow supposed, it would slow up so much that it would fall to the Deck, and . . .

No, it wouldn’t, he realized slowly. The GUTdrive was shut off: there was no gravity. Even if air resistance stopped the dart completely, it still wouldn’t fall.

‘When the gravity first disappeared,’ Tracker said, ‘I couldn’t hit a damn thing. I seemed to aim too high, every time. I quickly worked out why: even over quite short distances, gravity will pull a dart - or a cross-bow bolt - down a little way. I’ve grown up compensating for that, allowing for it unconsciously when

I aim at something.

‘In the absence of gravity the dart just sails on, in a straight line, until it hits something.’ She hefted the blowpipe. ‘It took me hours of practice before I felt confident with this thing in zero-gee; it was like learning from scratch all over again.’

Mark was nodding slowly. ‘So you think the Planners’ bowmen *meant* to hit us.’

‘I’m sure of it. But they shot too high. They haven’t learned to adjust to zero-gee; they certainly didn’t allow for it when they shot at us.’

Constancy-of-Purpose cupped her chin. ‘Maybe you’re right. But I don’t see how that helps us. Even if their aim is a little off, there are enough of them to blanket us with bolts if we try to get too close.’

‘Yes,’ Mark said, some excitement entering his artificial voice, ‘but maybe we can use Trapper’s insight in another way. She’s right; the Planners - everyone in that building - are failing to learn how to cope with

the absence of gravity. In fact, they seem to be denying that the absence even exists.' He glanced around, staring at the tracery of ropes they'd laid from the access ramps as if seeing them for the first time. 'And *so have we*. Look at the way we've travelled - abseiling across the floor, sticking to the familiar two dimensions to which gravity restricts us.'

Morrow frowned. 'What are you suggesting?'

Mark raised his face to the iron sky. 'That we try a little lateral thinking . . .'

At the origin of the weak, ancient signal Louise and Spinner found a worldlet. It was a dirty snowball three hundred miles across, slowly turning in the outer darkness.

When Louise bathed the worldlet with spotlights from her life-lounge, broken ice shone, stained with splashes of colour: rust-brown, grey.

This lost little fragment followed a highly elliptical path, each of its distorted journeys lasting a million years or more. Its closest approach to the Sun came somewhere between the orbits of Saturn and Uranus, while at its furthest it got halfway to the nearest star - two light-years from the inner worlds.

'Bizarre,' Louise mused. 'It's got the *orbital* characteristics of a long-period comet - but none of the *physical* characteristics. In morphology it's more like a Kuiper object, like Port Sol. But then it should be in a reasonably circular orbit . . .'

Spinner-of-Rope peered out of her cage at the dark little world, wondering what might still be living down there.

Here and there, in pits in the ice, metal gleamed.

'*Artefacts*,' Louise said. 'Can you see that, Spinner? Artifacts, all over the surface.'

'Human?'

'I'd guess so. But I don't recognize anything. And I doubt if there's much still working . . .

'I'm taking radar scans. There are hundreds of chambers in there, in the interior. And our beacon's somewhere inside: still broadcasting on all wavelengths, with a peak in the microwave range . . . Life knows what's powering it.'

'Is this ice-ball *inhabited*? Is there anyone here?'

‘I don’t know.’ Spinner heard Louise hesitate. ‘I guess I’m going to have to go down to find out.’

The pod’s small jets flared across the worldlet’s uneven surface as Louise descended. Spinner watched; the pod was the only moving thing in all of her Universe.

‘I’m close to the surface now,’ Louise reported. ‘I’ll level off. They certainly made a mess of this surface. I think these artifacts are sections of *ships*, Spinner. Not that I can label much of it - so much of this technology must be tens of millennia beyond us . . . Lethe, I wish we had the time to spend here, to study all this stuff.

‘But at least it’s *human*.’ Her voice sounded strained. ‘The first traces of humanity we’ve found in the whole damn System, Spinner.

‘I think people landed here, and broke up their ships for raw materials to occupy the interior.

‘I’m going to land now. I see what looks like a port.’

Louise couldn’t find any way to open the wide, hatch-like port to the interior. Instead, she had to erect a plastic bubble to serve as an airlock over the port, and cut her way through, working slowly in the microgravity.

‘All right, I’m in.’ Her breath was scratchy, shallow - almost as if she were whispering, Spinner thought. ‘It’s *dark* here, Spinner. I have lamps; I’m going to leave a trail of them, as I go through.’

Spinner, listening in her cage, prayed that nothing bad happened to Louise down there. If it did, what could she - Spinner - do? Would she have the courage even to try a landing on the ice worldlet?

Doubt flooded her, a feeling of inadequacy, of being unable to cope . . .

You’ll manage, Spinner-of-Rope.

That same dry, sourceless voice.

Strangely, her fears seemed to subside. She glanced around; of course, she was alone in the cage, with the nightfighter suspended passively over the ice worldlet. But still - again - she had had the impression that someone was *here* with her. She couldn’t see him, or her - but somehow she knew there was nothing to fear; she sensed a massive, comforting presence similar to her own, lost father.

But still - hearing voices? *What in Lethe is going on inside my head?*

‘ . . . Lots of chambers,’ Louise said a little breathlessly. ‘They are boxes, carved out of the ice and plated over with metal and plastic. A bit

cramped . . . There is air here, but foul; I won't be breaking my suit seal. This was definitely a human colony, Spinner. But it's all - neat. Tidy; abandoned in an orderly way.

'I guess they took a long time to die. They had time to clear up after themselves - to bury their dead, maybe, even, as they withdrew. I guess they went deeper as their numbers dwindled, towards the centre of the world . . . It's kind of dignified, don't you think? There are no signs of panic, or conflict. I wonder how *we* would behave, in the same circumstance. Spinner, I'm going on now.'

Later: 'I'm in a deeper layer of chambers. I think I've found the source of the signal.' She was silent for a while. Then, 'They sure built this to last.'

'Well, they got that right.'

'I still can't identify what's powering it . . . I guess one of the ship's GUTdrive plants on the surface. I think they used nanobots to maintain the beacon, Spinner. Maybe they adapted AS nanobots from their medical stores.' Her tone of voice changed, subtly, and Spinner imagined her smiling. 'They were determined to enable this to survive. But it's been millions of years . . . and the 'bots have made a few cumulative mistakes. The damn thing looks as if it's *melted*, Spinner. But it's still pumping out its signal, so we can't criticize too much . . .'

'Louise,' Spinner asked slowly, 'why were these people here? What were they trying to do?'

Louise thought for a while. 'Spinner, I think they were trying to *escape*.'

This ice-world was typical of the small, subplanetary bodies which could once have been found throughout the Solar System, Louise said, shepherded into orbital clusters by the major planets.

'But,' Louise said, 'the orbits of many of those little bodies were only *semistable* . Their orbits were intrinsically chaotic, you see . . . That means, over a long enough time period the minor bodies could move out of their stable pathways. They could even fall into the gravity wells of the major planets and be flung out of the System altogether. It's a form of *evaporation* - an evaporation of worlds and moons out of stellar systems. In fact, over a long enough scale - and I'm talking tens of billions of years now - the same thing would happen to the major planets too - and to stars, which could evaporate out of their parent galaxies . . . If,' she went on sourly, 'they had ever been given the chance.'

‘So you think this little world just evaporated away from Sol, gravitationally?’

‘No . . . not necessarily.’

Louise speculated about the closing stages of the Xeelee conflicts. She imagined mankind trapped within its home System, sliding towards the final defeat. Towards the end, even communication between the worlds might have broken down. Humanity would have been reduced to isolated pockets, cowering under the Xeelee onslaughts.

But some might have seen a way out - a way to try to escape the final investing of the System by the Xeelee.

Louise said, ‘Imagine this little worldlet following its semi-stable path - say, between the orbits of Saturn and Uranus. It wouldn’t have taken much to push it far enough out of its orbit to bring on orbital instability. And once equilibrium was lost, the drift away from the standard orbital elements could have been quite rapid - say, within a few orbits - and the decay wouldn’t have required any further deliberate - and observable - impulses, perhaps.’

Silently, all but invisibly to anyone watching, the little world, with its precious cargo of cowering, fearful humans, had looped through its increasingly perturbed orbit, falling at last - after many orbits, perhaps covering centuries - into the gravitational field of one of the major planets.

Then, finally, the worldlet was slingshot out of the Solar System.

‘If they’d got it right,’ Louise said, ‘maybe it would have been a viable plan. *If*. These people were going to the stars, by the lowest-tech way you can imagine. It would have taken tens of thousands of years to get to even the nearest star - but so what? They *had* tens of thousands of years to play with, thanks to AS - or the equivalent they’d developed by then. And locked up in the ice of the worldlet there was probably as much water as in the whole of the Atlantic Ocean . . . Going to the stars in an ice moon was certainly a better chance than staying here to be creamed by the Xeelee with the rest - it was a viable way to get out of all this, all but undetectable.

‘The scheme obviously attracted support. You can *see* the bits of ships, littering the surface . . . People must have fled here, quietly, from all over the collapsing System. The mission was a beacon of hope, I guess.

‘But—’

‘But what?’

‘But *they got it wrong.*

‘I’m going to go deeper now, Spinner.’

‘Be careful, Louise.’

There was a long silence, broken only by the sound of Louise’s shallow breath. Spinner filled her faceplate once more with cool, green leaf-light and stared into it, trying not to imagine what Louise was finding, down there inside the little tomb-world.

At length, Louise said: ‘Well, that’s it. I guess I’m here: the last place they occupied . . . the one place they couldn’t tidy up after themselves.’

Spinner stared into green emptiness. ‘What can you see?’

‘Abandoned clothes.’ Hesitation. ‘Dust everywhere. No bones, Spinner; no crumbling corpses . . . you can put your imagination away.’

After five megayears, there *would* only be dust, Spinner thought: a final cloud, of flakes of bone and crumbled flesh, settling slowly.

‘If they left records, I can’t find them,’ Louise said. She sounded as if she were trying to be unconcerned - to maintain control - but Spinner thought she could hear fragility in that level voice. ‘Perhaps there’s something in the electronics. But that would take years of data mining to dig out, even if we could restore the power. And we’re probably looking at technology a hundred thousand years beyond ours anyway . . .’

‘Louise, there’s nothing you can do in there. I think you should come out.’

‘ . . . Yes. I guess you’re right, Spinner-of-Rope. We don’t have time for this.’

Spinner thought she heard relief in Louise’s tone.

The little *Northern* pod clambered up from the worldlet’s shallow gravity well, towards the Xeelee craft.

Louise, safe inside her life-lounge, said: ‘They couldn’t control the slingshot well enough. Or maybe the Xeelee interfered with their plans.

‘They weren’t thrown out of the System as they’d planned, on an open-ended *hyperbolic* trajectory; instead they were put into this wide, and deadly, *elliptical* orbit - an orbit which was closed, taking them nowhere, very slowly.

‘I guess they tried to stick it out. Well, they’d broken up their ships; they had no choice. Maybe if we had time for a proper archaeological study here we could work out how long they lasted. Who knows? Hundreds of

thousands of years? Maybe they were hoping for rescue, for all that time, from some brave new future when humans had thrown out the Xeelee once more.

‘But it was a future that never came.

‘By the time they set up their beacon, their final plea for help, they must have known they were through - and that there *was* nobody to come to their aid.’

‘Nobody except us.’

‘Yes,’ Louise growled. ‘And what can we offer them now?’

‘What about the beacon?’

‘I shut it down,’ Louise said softly. ‘It’s served no purpose . . . not for five million years.’

Spinner sat in her Xeelee-crafted cabin, watching the grim little tomb of ice turn beneath her prow. ‘Louise? Where to now?’

‘The inner System. I think I’ve had it with all this bleakness and dark. Spinner-of-Rope, let’s go to Saturn.’

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19

Surrounded by swooping photino birds, Lieserl sailed around the core of the Sun. She let hydrogen light play across her face, warming her. The helium core, surrounded by the blazing hydrogen shell scorching

its way out through the thinning layers, continued to grow in the steady hail of ash from the shell. Inhomogeneities in the giant's envelope - clouds and clumps of gas, bounded by ropes of magnetic flux - moved across the face of the core, and the core-star actually cast shadows *outwards*, high up into the expanding envelope.

The photino birds swept, oblivious, through the shining fusion shell and on into the inert core itself. Lieserl watched as a group of the birds broke away and sailed off and out, to their unknowable destination beyond the Sun. She studied the birds. Had their rate of activity *increased*? She had the vague impression of a greater urgency about the birds' swooping orbits, their eternal dips into the core.

Maybe the birds knew the ancient human spacecraft, the *Northern*, was here. Maybe they were reacting to the humans' presence . . . It seemed fanciful - but was it possible?

The processes unfolding around the Sun were quite remarkably beautiful. In fact, she reflected now, every stage of the Sun's evolution had been beautiful - whether accelerated by the photino birds or not. It was too anthropomorphic to consider the lifecycle of a star as some analogy of human birth, life and death. A star was a construct of physical processes; the evolution it went through was simply a search for equilibrium stages between changing, opposing forces. There was no life or death involved, no loss or gain: just *process*.

Why *shouldn't* it be beautiful?

She smiled at herself. Ironic. Here she was, an AI five million years old, accusing herself of too much anthropomorphism . . . But, she thought uneasily, perhaps her true fault lay in not *enough* anthropomorphism.

The sudden communication from the humans outside - the whispers of maser light which had trickled down the flanks of the huge, dumb convection cells - had shaken her to her soul.

She'd undertaken her cycle of messages, she suspected strongly, because she was driven to it by some sinister bit of programming, buried

deep within her: not out of choice, or because she believed she might actually get a *reply*. So she'd packed her data with pictures of herself, and small, ironic jokes - all intended, she supposed, to signal to herself that this wasn't real: that it was all a game, unworthy of being taken seriously because there was no one left out there to hear.

Well, it seemed now, she'd been wrong. These people - of her own era, roughly, preserved by relativistic time dilation in their strange ship, the *Great Northern* - had returned to the Solar System.

And they were - she'd come to believe - *people who didn't approve of her.*

They hadn't said as much, explicitly. But she suspected an inner coldness was there, buried in the long communications they exchanged with her.

They thought she'd lost her objectivity - forgotten the reason she was placed in here in the first place. They thought she'd become an ineffectual observer, seduced by the rhythmic beauty of the photino birds.

Lieserl was some form of traitor, perhaps.

For the truth was - in the eyes of the men and women of the *Northern* - the photino birds were deadly. The birds were anti-human. They were killing the Sun.

They couldn't understand how Lieserl could not be *aware* of this stark enmity.

She closed her eyes and hugged her knees; the hydrogen shell, fusing at ten million degrees, felt like warm summer Sunlight on her Virtual face. She'd watched the photino birds do their slow, patient work, year after year, leaching away the Sun's fusion energy in slow, deadly, dribbles. She'd come to understand that the birds were killing the Sun - and yet she'd never thought really to wonder what was happening *outside* the Sun, in other stars. Had she vaguely assumed that the photino birds were somehow native to the Sun, like a localized infection? - But that couldn't be, of course, for she'd seen birds fly away from here, and come skimming down through the envelope to join the core-orbiting flock. So there *must* be birds beyond the Sun - significant flocks of them.

She realized now, with chilling clarity, that her unquestioned assumption that the birds were contained to just one star, coupled with her intrigued fascination with the birds themselves, had led her to *justify* the birds'

actions, in her own heart. It hadn't even mattered to her that the result of the birds' activity would be the death of Sol - perhaps, even, the extinction of man.

She quailed from this unwelcome insight into her own soul. She had once been human, after all; was she really so clinical, so *alien*?

The murder of Sol would have been bad enough. But in fact - the crew of the *Northern* had told her, in brutal and explicit detail - all across the sky, the stars were dying: ballooning into diseased giants, crumbling into dwarfs. The Universe was littered with planetary nebulae, supernovae ejecta and the other debris of dying stars, all rich with complex - and useless - heavy elements.

The photino birds *were* killing the stars: and not just the Sun, man's star, but *all* of the stars, out as far as the *Northern*'s sensors could pick up.

Already, there was nowhere in the Universe for humans to run to.

And she, Lieserl - the *Northern* crew seemed to believe - should be doing more than leaking out wry little messages via her maser convection cells. She should be screaming warnings.

Through her complex feelings, a mixture of self-doubt and loneliness, anger erupted. After all, what right did the *Northern* crew have to criticize her - even implicitly? She'd had no choice about this assignment - this immortal exile of hers in the heart of the Sun. She'd been allowed no *life*. And it wasn't *her* who had shut down the telemetry link through the wormhole, during the Assimilation.

Why, after millions of years of abandonment, should *she* offer any loyalty to mankind?

And yet, she thought, the arrival of the *Northern*, and the fresh perspective of its crew, had made her take a colder, harder look at the birds - and at herself - than she had for a *long* time.

She pictured the shadow universe of dark matter: a universe which permeated, barely touching, the visible worlds men had once inhabited . . . And yet that image was misleading, she thought, for the dark matter was no shadow: it comprised most of the Universe's total mass. The glowing, baryonic matter was a mere glittering froth on the surface of that dark ocean.

The photino birds - and their unknowable dark matter cousins, perhaps as different from the birds as were the Qax from humanity - slid through the

black waters like fish, blind and hidden.

But the small, shining fraction of baryonic matter seemed vital to the dark matter creatures. It was a catalyst for the chains of events which sustained their species.

For a start, dark matter could not form stars. And the birds seemed to *need* the gravity wells of baryonic stars.

When a clump of baryonic gas collapsed under gravity, electromagnetic radiation carried away much of the heat produced - it was as if the radiation *cooled* the gas cloud. The residual heat left in the cloud eventually balanced the gravitational attraction, and equilibrium was found: a star formed.

But dark matter could not produce electromagnetic radiation. And without the cooling effect of the radiation, a dark matter cloud, collapsing under gravity, trapped much more of *its* heat of contraction. As a result, much larger clouds - larger than galaxies - were the equilibrium form for dark matter.

So the early Universe had been populated by immense, cold, bland clouds of dark matter: it had been a cosmos almost without structure.

Then the baryonic matter had gathered, and the stars began to implode - to shine. Lieserl imagined the first stars sparking to life across the cosmos, tiny pinprick gravity wells in the smooth oceans of dark matter.

The photino birds lived off a trickle of proton-photino interactions, which fed them with a slow, steady drip of energy. And to get a sufficient flow of energy the birds needed *dense* matter - densities which could not have formed without baryonic structures.

And the birds' dependence on baryonic matter extended further. She knew that the birds needed templates of baryonic material even to reproduce.

So baryonic-matter stars had given the photino birds their very being, and now fed them and enabled them to reproduce.

Lieserl brooded. A fine hypothesis. But *why*, then, should the birds be so eager to kill off their mother-stars?

Once more the chatter of the humans from the *Northern* passed through her sensorium, barely registering. They were asking her more questions - requesting more detailed forecasts of the likely future evolution of the suffering Sun.

She sailed moodily around the core, thinking about stars and the photino birds.

And her mind made connections it had failed to complete before in millions of years.

At last, she saw it: the full, bleak picture.

And, suddenly, it seemed urgent - terribly urgent - to answer the humans' questions about the future.

She hurried to the base of her convection cells.

The shower's needle-sharp jets of water sprayed over Louise's skin. She floated there at the centre of the shower cubicle, listening to the shrill gurgle of the water as it was pumped out of the booth. She lifted her arms up and let the water play over her belly and chest; it was hot enough, the pressure sufficiently high, to make her battered old skin tingle, as if it were being worked over by a thousand tiny masseurs.

She hated being in zero-gee. She always had, and she hated it still; she even loathed having to have a pump to suck the water out of her shower for her. She'd insisted on having this shower installed, curtained off in one corner of the life-lounge, as her one concession to luxury - *no, damn it,* she thought, *this is no luxury; the shower is my concession to what's left of my humanity.*

A hot shower was one of the few sensual experiences that had remained *vivid,* as she'd got so absurdly old. High-pressure, steaming water could still cut through the patina of age which deadened her skin.

There was hardly anything else left. Since her sense of smell had finally packed up, eating had become a process of basic refuelling, to be endured rather than enjoyed. And, apart from her Virtuals, nothing much stimulated her mentally; it would take more than a thousand-year life to exhaust the libraries of mankind, but she'd long since wearied of the ancient, frozen thoughts of others, rendered irrelevant by the death of the Sun.

She turned off the spigot. Hot air gushed down around her, drying her rapidly. When the droplets had stopped floating off her skin she pulled back the shower curtain.

The lounge was basic - it contained little more than this shower, a small galley, a sleeping cocoon and her data desk with its processor bank. Lashed up in haste from sections of the *Northern*'s hull material, the lounge was a squat cylinder five yards across, crouched on the shoulders of the Xeelee

craft like a malevolent parasite - utterly spoiling the lines of the delicate nightfighter, Louise had thought regretfully. The walls of the lounge were opaqued to a featureless grey, making the lounge rather dingy and claustrophobic. And the place was a mess. Bits of her clothing drifted around in the air, crumpled and soiled, and she was conscious of a stale smell. She really ought to clean up; she knew she utterly lacked the obsessive neatness needed to survive for long in zero gee.

She reached for a towel drifting in the air close by. She rubbed herself vigorously, relishing the feeling of the rough fabric on her skin. A mere blast of air never left her feeling really *dry.*

The feel of the warm towel on her skin made her think, distantly, about sex.

She'd always had a sour public persona: people saw her as an engineer obsessed with her job, with building things *out there*. But there was more to her than that - there were elements which Mark had recognized and treasured during their marriage. Sex had always been important to her: not just for the physical pleasure of it but also for what it symbolized: something deep and old within her, an echo of the ancient sea whose traces humans still carried, even now. The contrast of that oceanic experience with her work had made her more complete, she thought.

After she and Mark had reconciled - tentatively, grudgingly, in recognition of their joint isolation in the *Northern* - they had revived their vigorous sex life. And it had been good, remaining vital for a long time. Longer than either of them had a right to expect, she supposed. She wrapped the towel around her back and began to rub at her buttocks. Maybe if Mark had stayed alive—

The lounge walls snapped to transparency; space darkness flooded over her.

Louise cried out and pulled the towel around her body.

From her comms desk came the sound of laughter.

She scrambled in a locker for fresh clothes. The door of the jury-rigged locker jammed and she hauled at it, swearing, aware of the towel slipping around her.

'By Lethe's waters, Spinner, what do you think you're doing?'

Louise could just make out Spinner's cage, a box of winking lights at the prow of the nightfighter. A shadow moved across the lights - Spinner,

probably, twisting in her couch to take a mocking look at her. ‘I’m sorry. I *knew* you’d be embarrassed.’

Louise had found a coverall; now she thrust her legs into it. ‘Then why,’ she said angrily, ‘did you invade my privacy by doing it?’

‘What difference does it make? Louise, there’s no one to see; we’re a billion miles from the nearest living soul. *And* you’re a thousand years old. You, really ought to rid yourself of these taboos.’

‘But they’re *my* taboos,’ Louise hissed. ‘I happen to like them, and they make a difference to *me*. If you ever get to my age, Spinner-of-Rope, maybe you’ll learn a little tolerance.’

‘Well, maybe. Anyway, I didn’t de-opaque your walls just to catch you with your pants off.’ She sounded mischievous.

Suspiciously, Louise asked, ‘Why, then?’

‘Because—’ Spinner hesitated.

‘Because what?’

‘Look ahead.’

There was a point of light, far ahead, beyond Spinner’s cage: a point that ballooned, now, exploding at her face—

Saturn, plummeting out of emptiness at her.

Louise cried out and buried her face in her hands.

‘Because,’ Spinner said softly, ‘we’re there. I thought you’d enjoy watching our arrival.’

Louise opened her fingers, cautiously.

Steady, orange-brown light shone into her cabin: the light of a planet, illuminated by the bloated body of its Sun.

Spinner was laughing softly.

Louise said slowly, ‘Spinner - if this is Saturn - *where are the rings*?’

‘Rings? What rings?’

The planet itself was the same swollen mass of hydrogen and helium, with its core of rock twenty times as massive as Earth intact, deep within it. Elaborate cloud systems still wound around the globe, like watercolour streaks of brown and gold, just as she remembered. And the largest moon, Titan, was still there.

But the *rings* had gone.

Louise hurried to her data desk.

‘ . . . Louise? Are you all right?’

From the surface of the city-world of Titan, the rings had been a line of light, geometrically precise, vivid against the autumn gold of Saturn . . .

Louise made herself reply. ‘I think I’m mourning the rings, Spinner. They were the most beautiful sight in the Solar System. Who would smash up such harmless, magnificent beauty? And, damn it, they were *ours*.’

‘But,’ said Spinner, ‘there *is* a ring here. I can see it. Look . . .’

Following Spinner’s directions, Louise studied her data desk.

The ring showed up as a faint band across the stars, a shadow against the swollen, imperturbable bulk of the planet itself.

Once, three ice moons had circled outside the orbit of Titan: Iapetus, Hyperion and retrograde Phoebe. All that was left of those three moons was this trail of rubble. Thin, colourless, with no evidence of structure, the ring of ice chunks, glowing red in the light of the dying Sun, circled the planet at about sixty planetary radii, a pale ghost of its glorious predecessor.

And where were the other moons?

Louise paged through her data desk. Once, Saturn had had seventeen satellites. Now - as far as she could tell from their orbits - only Titan and Enceladus remained. And there wasn’t much left of Enceladus at all; the little moon still swung through an orbit around four planetary radii from Saturn, but its path was much more elliptical than before. Its surface - always broken, uneven - had been left as rubble. There was no sign of the small human outposts which had once sparkled against the shadows of its curved ridges and cratered plains.

The rest of the moons - even the harmless, ten-mile-wide islands of water ice - had gone.

Louise remembered the ancient, beautiful names. *Pan, Atlas, Prometheus, Pandora, Epimetheus* . . . Names almost as old, now, as the myths from which they had been taken; names which had outlived the objects to which they’d been assigned.

‘Louise?’

‘I’m sorry, Spinner.’

‘Still mourning?’

. . . Janus, Mimas, Tethys, Telesto . . .

‘Yes.’

‘I guess somebody has to.’

‘Spinner, what *happened* here?’

‘A battle,’ Spinner said quietly. ‘Obviously.’

Calypso, Dione, Helene, Rhea, Hyperion, Iapetus, Phoebe . . .

The nightfighter spread its hundred-mile wings, eclipsing the debris of the shattered moons.

Milpitas sat in his office. From throughout the Temple, there were the sounds of shouting, of screams, of yelled words too indistinct for him to hear.

The shouting seemed to be coming closer.

He cleared his magnetized desk top, putting his paper, pens, data slates away into drawers. He folded his hands and held them over the desk.

The door to his office was opened.

The renegade from - *outside* - hovered there in the air. He was almost horizontal from Milpitas’ point of view: as if he were defying the Planner to fit him into his orderly, gravity-structured Universe.

The renegade spread his empty hands. ‘I’m not going to hurt you.’

‘I know you,’ Milpitas said slowly.

‘Perhaps you do.’ The renegade was tall, quite well-muscled; he wore a practical coverall equipped with a dozen pockets which were crammed with unidentifiable tools. He wore his hair short, but not shaven-clean; his look was confident, even excited. Milpitas tried to imagine this man without the hair - and with a little less of that damnable confidence, too - in standard, drab Paradoxa coveralls, and with a more appropriate posture: stooped shoulders, perhaps, hands folded before him . . .

‘My name’s Morrow. You had a certain amount of - trouble - with me.’ The renegade glanced around at the office, as if recalling some sour experience. ‘I was in here several times, as you tried to explain to me how wrong I was in my thinking . . .’

‘*Morrow*. You disappeared.’

Morrow frowned. ‘No. No, I didn’t disappear. Milpitas, you sound like a child who believes that as soon as an object is out of sight, it no longer exists . . .’

Milpitas smiled. ‘What do *you* know of children?’

‘Now, a lot,’ Morrow said. He smiled, in turn, quite in control. ‘I didn’t disappear, Milpitas. I went somewhere else. I’ve done extraordinary things, Planner - seen wonderful sights.’

Milpitas folded his hands and settled back in his chair. ‘How did you get in?’

‘Past your sentries?’ Morrow smiled. ‘*We came in from above*. It took seconds, and we were quite silent. Your sentries were positioned to watch for an approach across the Deck; they didn’t imagine anyone would come in over their heads. They didn’t even know we were in the building, before we took them out.’

‘“Took them out”?’

‘They’re unconscious,’ Morrow said. ‘The forest people use a certain type of frog sweat, which . . . well, never mind. The sentries are unharmed.’

Milpitas tried to think of something to say - some words with which he could regain control of the situation. He felt a rising panic; suddenly, his orders had failed to be executed. He felt as if he were at the heart of some immense, dying machine, poking at buttons and levers which were no longer linked to anything.

Morrow’s voice was gentle. ‘It’s over. I know you believe what you’re doing is right, for the people. But this is for the best, Milpitas. More deaths would have been - inexcusable. You see that, don’t you?’

‘And the *mission*?’ Milpitas asked bitterly. ‘The goals of Paradoxa? What of that?’

‘That’s not over,’ Morrow said. ‘Come back with me, Milpitas. There are remarkable things out there. The mission is still alive . . . I want you to help me - help us - achieve it.’

Milpitas closed his eyes again; suddenly he felt immensely old, as if the energy which had sustained him for the best part of a thousand years were suddenly drained away.

‘I don’t know if I can,’ he said honestly.

Someone, in the depths of the Temple, stilled the klaxon at last; the final, chilling echoes of its wail rattled from the close, claustrophobic metal sky.

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20

The pod slid, smooth and silent, down towards Titan.

Louise clutched at her seat. The hull was quite transparent, so that it felt as if she - swathed in her environment suit, with a catheter jammed awkwardly inside her - were suspended helplessly above the pale brown clouds of Titan.

Above her, the Xeelee nightfighter folded its huge wings.

Titan, Saturn's largest satellite, was a world in itself: around three thousand miles across, larger than Earth's Moon. As she descended, the cloudscape took on the appearance of an infinitely flat, textured plane. Huge low pressure systems in the photochemical smog spiralled around the world, and small, high clouds scudded across the stratosphere.

The first thin tendrils of air curled around the walls of the pod. Overhead, the stars were already misting out.

Suddenly the pod dropped, precipitously. She was jarred down into her seat. Then the little craft was yanked sideways, rocking alarmingly.

'Lethe,' Louise said ruefully, rubbing her spine.

Louise had left Spinner in the lounge, to follow the pod's progress on the data desk. 'Are you all right?' Spinner asked now.

'I've been better . . . I'm not hurt, Spinner-of-Rope.'

'You knew you had to expect this kind of treatment. Titan's atmosphere is a hundred miles thick: plenty of scope for generating a lot of weather. And there are high winds, up there at the top of the atmosphere.'

It was quite dark in the cabin now; the opaque atmosphere had enfolded the pod completely, leaving only the cabin lights to gleam from the transparent walls.

Spinner went on, 'And did you know Titan has seasons? It's spring; you've got to *expect a* lot of turbulence.'

As the pod dropped further it shuddered against a new onslaught; this time Louise thought she actually heard its structure creak.

'Spring,' murmured Louise. '"Where are the songs of Spring? Ay, where are they?"'

'Louise?'

'John Keats, Spinner-of-Rope. Never mind.'

Now the buffeting of the little ship seemed to lessen; she must have passed through the high-wind stratosphere. She pulled out a little slack in the restraints which bound her to the seat. Beyond the hull, the cabin lights illuminated flakes of ammonia ice, and fine swirls of murky gas shot up past the pod and out of sight.

‘It’s bloody dark,’ she muttered.

‘Louise, you’re dropping into a mush of methane, ethane and argon. It’s a smog of photochemical compounds, produced by the action of the Sun’s magnetosphere on the air - I can see a lot of hydrogen cyanide, and—’

‘I know all that,’ Louise growled, gripping her seat as the pod lurched again. ‘Don’t read out the whole damn data desk to me. Photochemical compounds aren’t what I came down here to find.’

‘What, then?’

‘ . . . *People*, Spinner.’

Once, this had been the most populous world outside the orbit of Jupiter: Titan had cradled mankind’s most remote cities. Surely - Louise had thought - if anywhere had survived the devastation that had struck the inner worlds it would be here.

She needed to *see* what was going on. Louise punched at the control pad before her. The walls of the pod faded to pearly opacity. She called for a Virtual image, an amalgam constructed of radar and other data.

Below her, in the pod’s Virtual windows, the landscape of Titan assembled itself, as if from elements of a dream.

She banked the pod and took it skimming over the crude Virtual representation, fifty miles above the surface.

Titan had a core of rock at its heart, clad by a thick mantle of frozen water-ice. Beneath the obscuring blanket of atmosphere, eighty per cent of the solid ice surface was covered by oceans of liquid methane and ethane, richly polluted by hydrocarbons. The remaining fraction of ‘dry’ ice-land was too sparse to form into sizeable continents; instead, ridges of water-ice, protruding above the methane, formed strings of islands and long peninsulas.

Well, the oceans were still here. Louise let the ancient, familiar names roll through her head: there was the Kuiper Sea, Galilei Archipelago, the Ocean of Huygens, James Maxwell Bay . . .

But, of the humans who had once named this topography, there was no sign. In fact, it was as if they had never been.

Once, huge factory ships had sailed across these complex oceans, trailing high, oily wakes; enough food had been manufactured in those giant ships to feed all of Titan, and most of the other colony-moons in the Saturn system as well. There were no ships here now. Maybe, if she looked hard enough, she would find traces of huge metal carcasses, entombed in the ice floors of the chemical seas.

. . . But now there seemed to be something approaching over the tight-curving horizon: a feature which didn't chime with her memory. She leaned forward in her seat, trying to see ahead more clearly.

It was a ridge of ice, looming over the oceans, stretching from side to side of her field of view as it came over the edge of the world.

'Spinner - *look*.'

'I can't quite make it out - it doesn't seem to fit the maps . . .'

'Maps?' Louise muttered. 'We may as well throw the damn things out.'

It was the rim of a crater - a crater so huge it sprawled like an immense scar around the curve of the planet. Within the mile-high walls of the crater, a new sea, deep and placid, lapped its huge low-gravity waves.

'Well, that wasn't here before,' Spinner said. 'It's wiped out half the surface of the moon.'

Louise had Spinner download projections of the crater's overall shape, the deep profile hidden from view by the circular methane ocean it embraced.

Beneath the ocean surface the crater was almost cylindrical, with sharp, vertical walls and a flat base.

'Volcanic, do you think?' Spinner asked.

'It doesn't look like any volcano mouth I've ever seen,' Louise said slowly. 'Anyway, Titan is inert.'

'Then what? Could it be an impact crater? Maybe when the moons got broken up—'

'Look at it, Spinner,' Louise said impatiently. 'The shape's all wrong; this was no impact.'

'Then what?'

Louise sighed. 'What do you think? We've come all this way to find another relic of war, Spinner-of-Rope. Now we know what happened to the

people. When whatever caused *that* struck Titan, the whole surface of the moon must have convulsed. No wonder the cities were lost . . .'

She imagined the ice-ground cracking, becoming briefly liquid once more, swallowing communities whole; there must have been mile-high tidal waves in the low gravity methane seas, overwhelming the food ships in moments.

Spinner was silent for a while. Then, 'You're saying this was done deliberately? '

Louise smiled. Paradoxa, reconstructing the future from the glimpses left by Michael Poole's encounter with the Qax, had come across the concept of a *starbreaker*: a planet-smashing weapon wielded by the Xeelee - a weapon based on focused gravity waves. Paradoxa had even had evidence that a starbreaker of limited power had been deployed inside the Solar System itself: by the Qax invaders from the future, during their failed onslaught on the craft of the Friends of Wigner.

She said to Spinner, 'You ought to be getting used to this by now. We know the Xeelee had weaponry sufficient to destroy worlds. For some reason they spared Titan. Instead - *they wiped it clean*. Just as they did Callisto.'

Louise took the pod down to one of the largest individual islands, close to the rough rim of the Kuiper Sea. There was a soft crunch when she landed, as the pod crushed the friable-ice surface.

A small airlock blistered out of the side of the pod's hull, and Louise climbed through it.

Instantly she was enclosed by a shell of darkness. In the murk of photochemical smog, her suit lights penetrated barely a few feet. Looking down she could only just make out the surface. Under a layer of thick frost, which creaked as it compressed under her boots, the ground was firm, flat. She lifted herself on her toes, trying her weight; she felt light, springy, under Titan's thirteen per cent gee. There was a soft wind which pushed at her chest.

Snow, drifting down from the huge atmosphere, began to lace across her faceplate; it was white and stringy, and - when she tried to wipe it off with her glove - it left clinging remnants. It was a snow of complex organic polymers, drifting down from the hundred-mile-thick chemical soup above her head.

‘Louise? Can you still hear me?’

‘I hear you, Spinner.’

She took a few steps forward, away from the gleaming pod; soon, its lights were almost lost in the polymer sleet.

‘You know, we terraformed Titan,’ Louise told Spinner. ‘There were ships to extract food and air from the seas. You could walk about on the surface in nothing more than a heated suit. We got the atmosphere *clear*, Spinner-of-Rope. You could see Saturn, and the rings. And the Sun. You knew you weren’t alone down here - that you were part of the System . . .’

Now, the terraforming had collapsed. Titan had reverted. It was as if humans had never walked Titan’s surface.

‘There used to be a city here, Spinner. *Port Cassini*. Huge, glittering caverns in the ice; igloos on the surface . . . A hundred thousand people, at least.

‘Mark was born here. Did you know that?’ She looked around, dimly. ‘And as far as I can remember this was the site of his parents’ home . . .’

She tried to imagine how it must have been to stand here as the final defence around Titan fell, and the Xeelee onslaught began. *The starbreaker beams - cherry-red, geometrical abstractions - burned down, through the hydrocarbon smog, from the invisible nightfighters far above the surface. Methane seas flash-evaporated in moments - and the ancient water-ice of the mantle flowed liquid for the first time in billions of years . . .*

‘Louise? Are you ready to go home, now?’

‘Home?’ Louise raised her face to the hidden sky and allowed the primeval, polymeric snow to build up over her faceplate; for a moment, tears, ancient and salty, blinded her. ‘Yes. Let’s go home, Spinner-of-Rope.’

‘*Helium flash*,’ Mark said.

Uvarov had been dozing; his dreams, as usual, were filled with birds: ugly carrion-eaters, with immense black wings, diving into a yellow Sun. When Mark spoke, the dreams imploded, leaving him blind and trapped in his chair once more. He felt a thin, cold sensation in his right arm: another input of concentrated foodstuffs, provided by his chair.

Yum, he thought. *Breakfast.*

‘Mark,’ he whispered.

‘Are you all right?’

‘All the better for your cheery questioning, you - *construct*.’ He spoke with a huge effort, fighting off his all-encompassing tiredness. ‘If you’re so concerned about my health, plug yourself into my chair’s diagnostics and find out for yourself. *Now*. Tell me again what you said. And what in Lethe it means . . .’

‘Helium flash,’ Mark repeated.

Uvarov felt old and stupid; he tried to assemble his scattered thoughts.

‘We’ve heard from Lieserl. Uvarov, the birds are continuing to accelerate the evolution of the Sun.’ Mark hesitated; his intonation had gone flat, a sign to Uvarov of his distraction. ‘I’ve put together Lieserl’s observations with a little extrapolation of my own. I think we can tell what’s going to come next . . . Uvarov, I wish I could show you. In pictures - a Virtual simulation - it would be easy.’

‘Well, you can’t,’ Uvarov said sourly, twisting his face from side to side. ‘Sorry to be so *inconvenient*. You’re just going to have to hook up a few more processor banks to enhance your imagination and tell me, aren’t you?’

‘ . . . Uvarov, the Sun is *dying*.’

For millions of years, the photino birds had fed off the Sun’s hydrogen-fusing core. Each sip of energy, by each of Lieserl’s birds, had lowered the temperature of the core, minutely.

In time, after billions of interactions, the core temperature had dropped so far that hydrogen fusion was no longer possible. The core had become a ball of helium, dead, contracting. Meanwhile, a shell of fusing hydrogen burned its way out of the Sun, dropping a rain of helium ash onto the core.

‘The inert core has steadily got more massive - contracting, and heating up. Eventually the helium in the collapsing core became degenerate - it stopped behaving as a gas, because—’

‘I know what degenerate matter is.’

‘All right. But you have to be clear about why that’s important, for what comes next. Uvarov, if you heat up degenerate matter, it doesn’t *expand*, as a gas would . . . Degenerate matter is *not* a gas; it doesn’t obey anything like the gas laws.’

‘So we have this degenerate, dead core of helium, the burning shell around it. What next?’

‘Now we start speculating. Uvarov, in a conventional giant, when the core mass is high enough - about half a Solar mass - the temperature

becomes so high, a hundred million degrees or more, that a *new* fusion chain reaction starts up: the triple-alpha reaction, which—'

'The fusion of the helium ash into carbon.'

'Yes. Suddenly the "dead" core is flooded with helium fusion energy. Now remember what I told you, Uvarov: the core is degenerate. So it doesn't expand, to compensate for all that heat . . .'

'You turn condescension into an art form,' Uvarov growled impatiently.

'*Because* it can't expand, the core can't cool off. There is a runaway fusion reaction - a *helium flash* - lasting no more than seconds. After that, the core starts to expand again, and eventually a new equilibrium is reached —'

'All right. That's the standard story; now let's get back to the Sun. Sol isn't a conventional giant, whatever it is.'

'No. But it's approaching its helium flash point.'

'Won't the action of the birds suppress this helium runaway - the helium flash - just as they've suppressed hydrogen fusion, all this time?'

'No, Uvarov. They're not taking out enough energy to stop the flash . . . Maybe they don't intend to. And, of course, the fact that the core of Sol is so unusually hydrogen-rich is going to make a difference to the outcome. Perhaps there will be some hydrogen fusion in there as well, a complex multiple reaction.'

'Mark. You said a new *equilibrium* will be reached, after the helium flash.' Uvarov didn't like the sound of that. He wondered if it would be healthy to be around, while an artificially induced red giant struggled to find a new stability after the explosion of its core . . . 'What will happen, after the helium flash?'

'Well, the pulse of heat energy released by the flash will take time - some centuries - to work its way through the envelope. The envelope will expand further, seeking a new balance between gravity and radiation pressure. And the energy released in the flash will be immense, Uvarov.'

'*Immense*?'

'Uvarov, there will be a superwind.'

Superwind . . .

The helium flash would blow away half the mass of the Sun, into an expanding shell ballooning outwards at hundreds of miles a second.

The core - exposed, a shrunken thing of carbon-choked helium - would become a *white dwarf star*: cooling rapidly, with half the mass of Sol but just a few thousand miles across, no larger than old Earth. The flocks of photino birds, insubstantial star-killers, would continue to swoop around the heart of Sol's diminished gravity well.

At present - before the flash - Sol was a red giant around two astronomical units across. After the superwind the envelope would be blown into a globe *twenty thousand times* that size, a billowing, cooling cloud three hundred light-days across.

The furthest planet from the heart of old Sol was only forty astronomical units out - six light-hours. So the swelling envelope would, at last, smother all of Sol's children.

Then, when the superwind was done, the dwarf remnant would emit a new wind of its own: a fizz of hot, fast particles which would blow at the expanding globe, pushing out the inner layers. The globe would become a *planetary nebula* - a huge, cooling, hollow shell of gas, fluorescing in the light of the dying dwarf at its heart.

Mark said, 'At last, of course, the fusing helium in the core will be exhausted. Then the core will shrink once more, until the temperature of the regions around the core becomes high enough for helium fusion to start - in a shell *outside* the core, but *within* the hydrogen-burning shell. And the helium fusion will deposit carbon ash onto the core, growing in mass and heating it up - until the fusion of carbon begins . . .

'The cycle repeats, Uvarov. There will be carbon flashes - and, later, flashes of oxygen and silicon . . . At last, the giant might have a core of almost pure iron, with an onion-shell structure of fusing silicon, oxygen, carbon, helium and hydrogen around it. But iron is a dead end; it can only fuse by *absorbing* energy, not liberating it.'

'And all this will happen to the Sun?'

Mark hesitated. 'Our standard models say that the reactions go all the way to iron only in stars a lot more massive than the Sun - say, twelve Solar masses or more.' He sighed, theatrically. 'Will we get onion-shell fusion in the heart of the Sun? I don't know, Uvarov. We may as well throw out our theoretical models, I guess. If the photino birds are as widespread as they seem to be, there may not be a single star in the Universe which has followed through a "standard" lifecycle.'

‘*Superwind*,’ Uvarov breathed. ‘How soon is Sol’s helium flash?’

‘Lieserl’s observations are sketchy on this. But, Uvarov, the conditions are *right*. The flash may even have happened by now. The superwind could already be working its way out . . .’

‘How soon, damn you?

‘We have a few centuries. No more.’

Uvarov swept his blind face around the saloon. He pictured the ruined Jovian system beyond these walls, the bloated star dominating the sky outside.

‘Then *we can’t stay here*,’ he said.

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21

By the time she'd climbed to the top of the giant kapok tree her hand-grips were slick with sweat, and her lungs were pumping rapidly. Spinner-of-Rope took off her spectacles and wiped the lenses on a corner of her loincloth. Zero-gee or not, it still took an effort to haul her bulk around this forest . . . an effort that seemed to be increasing with age, despite all the AS treatment in the world.

She was at the crown of the kapok. The great tree was a dense, tangled mass of branches beneath her. Seeds drifted everywhere, filling the rippling canopy with points of light - like roaming stars, she thought. Somewhere a group of howler monkeys shrieked out their presence. Their eerie ululation, rising and falling, reminded her of the klaxon which had once called the Undermen to their dreary work . . .

She put that thought out of her mind with determination. She pulled some dried meat from her belt and chewed on it, relishing the familiar, salty taste. She felt *tired*, damn it; she'd come here, alone, because she wanted - just for a few hours - to put all of the strangeness below the forest Deck, and beyond the skydome, out of her mind, to immerse herself once more in the simple world in which she'd grown up.

In the distance a bird flapped, shrieking, its colours gaudy against the bland afternoon blue of the skydome.

The bird was flying upside down.

'Spinner-of-Rope.'

The voice was close to her ear. Still chewing her meat, Spinner turned, slowly.

Louise Ye Armonk hovered a few feet away, standing on the squat, neat platform of a zero-gee scooter. Louise grinned. 'Did I make you jump? I'm sorry for cheating with this scooter; I'm not sure I would have managed the climb.'

Spinner-of-Rope glared at her. 'Louise. Never - *never* - sneak up on someone at the top of a tree.'

Louise didn't look too concerned. 'Why not? Because you might lose your grip, and drift off the branch a couple of feet? What a disaster.'

Spinner tried to maintain her anger, but she started to feel foolish. 'Come on, Louise. I'm trying to make a point.'

Louise, skilfully, brought her scooter in closer to Spinner; without much grace she clambered off the scooter and onto the branch beside Spinner. ‘Actually,’ she said gently, ‘so am I.’ She breathed deeply of the moist forest air, and looked around the sky. ‘I saw you watching that bird.’

Spinner pushed her spectacles up the bridge of her nose. ‘So what?’

Louise picked at the tree bark. ‘Well, the bird seems to be doing its best to get by, in zero-gee.’

‘Maybe. Not everyone here is doing so well,’ Spinner said heavily. The loss of gravity was, slowly but surely, devastating the forest biota. ‘The higher birds and animals seem to be adapting okay . . . The monkeys quickly learned to adjust the way they climb and jump. But otherwise, things are falling apart, in a hundred tiny ways.’ She thought of spiders which could no longer spin webs, of tree-dwelling frogs which found their tiny leaf-bound ponds floating away into the air. ‘We’re doing our best to keep things working - to save whatever we can,’ she said. ‘But, damn it, even the rain doesn’t fall right any more.’

Louise reached out and took her hand; the old engineer’s skin was cold, leathery. ‘Spinner, we have to re-establish all of this. Permanently.’ Louise lifted her face; the diffuse light of the dome softened the etched-in age lines. ‘I *designed* this forest Deck, remember. And this is the only fragment of Earth that’s survived, anywhere in the Universe - as far as we know.’

Spinner-of-Rope pulled her hand away. ‘I know what your little parable about the bird was about, Louise. I should adapt, just like the plucky little bird. Right? You want me to come back to the nightfighter.’

Louise nodded, studying her.

‘Well, it was a dumb parable. The bird is the *exception*, not the rule. And—’

‘Spinner, I know you needed a break. But you’ve been climbing around these trees for a long time, now. I need you to come back - we all do. I know it’s difficult for you, but you’re the only person I have who can do the job.’

Spinner watched her face, sceptically. ‘But we’re not talking about mere discontinuity-drive jaunts around the Solar System now. Are we, Louise?’

‘No.’ Louise wouldn’t meet her eyes.

Spinner felt a hollowness in her chest - as if it had expanded, leaving her heart fluttering like a bird in some huge cavity. *Hyperdrive* . . .

‘Spinner, we need the hyperdrive. You understand that, don’t you? *The Sun is dying*. Perhaps we could attempt to establish some sort of colony here, in the Solar System. But we need to find out what’s happening beyond the System. Are there any people left, anywhere? Maybe we can join them - find a better place than the Solar System has become.

‘But, without the hyperdrive, journeys like that would take millennia, more - even with the discontinuity drive. And I don’t think we *have* millennia . . .’

Spinner took a deep breath. ‘Yes, but . . . Louise, what will happen when I throw the switch? How will it feel?’

Louise hesitated. ‘Spinner, *I don’t know*. That’s the truth; that’s what we want to find out from the first flight. We aren’t going to know for sure until we try it in anger. Mark and I have only just begun to put together theories on how the damn hyperdrive works . . . Spinner, all we know is it’s something to do with *dimensionality* .’

A conventional craft (Louise said) worked in a ‘three-plus-one’ dimensional spacetime - three spatial dimensions, plus one of time. And within those dimensions nature was described by a series of fundamental constants - the charge on the electron, the speed of light, the gravitational constant, Planck’s constant, and others.

But - humans believed - physics was governed by the *Spin(10)* theory, which described symmetries among the forces of nature. And the symmetries needed to be expressed in *higher* dimensions than four.

‘So, Spinner-of-Rope, there are more than three spatial dimensions,’ Louise said. ‘But the “extra dimensions” are compactified—’

‘They’re what?’

‘Collapsed down to the smallest possible scale - to the Planck scale, below which quantum physics and gravitation merge.’

Once - just after the initial singularity - the forces of physics were one, and the Universe was fully multi-dimensional. Then the great expansion started.

‘Three of the spatial dimensions expanded, rapidly, to the scales we see today. The other dimensions remained compactified.’

‘Why did *three* dimensions expand? Why not four, or two, or one - or none at all?’

Louise laughed. ‘That’s a good question, Spinner. I wish I had a good answer.

‘Geometrically, three-dimensional spaces have some unique attributes. For instance, only in three dimensions is it possible for planets to have stable orbits governed by the central forces exerted by stars. Did you know that? Planets in a *four*-dimensional cosmos would drift into space, or spiral into their suns. So if life needs billions of years of a stable planetary environment, three dimensions are the only possibility. Matter isn’t *stable* in higher dimensions, even: the Schrodinger wave equation would have no bound solutions . . . And waves can propagate without distortion, only in three dimensions. So if we need high-fidelity acoustic or electromagnetic signals to be able to make sense of the world, then again, three dimensions is the only possibility.

‘Spinner, maybe there are alternate universes, out there somewhere, where more than three dimensions ballooned up after the initial singularity. But as far as we can see, life - our kind of life - couldn’t have evolved there; the fundamental geometry of spacetime wouldn’t have allowed it . . .

‘Remember, though, the extra dimensions are here, still, but they’re rolled up very tightly, into high-curvature tubes a Planck length across.’

‘So we can’t see them.’

‘No. But - and here’s the trick we think the Xeelee have exploited, Spinner - the extra dimensions *do* have an impact on our Universe. The curvature of these Planck tubes *determines the value of the fundamental constants of physics*. So the *way* the tubes are folded up determines things like the charge of an electron, or the strength of gravity.’

Spinner nodded slowly. ‘All right. But what has this to do with the hyperdrive?’

‘Spinner-of-Rope, we think the Xeelee found a way to *adjust* some of those universal numbers. By changing the constants of physics - in a small region of space around itself - the hyperdrive can make spacetime unfurl, just a little.’ Louise lifted her face. ‘Then the nightfighter can move, a short distance, through one of the higher dimensions.

‘Think of a sheet of paper, Spinner. If you’re confined to two dimensions - to crawling *over* the paper - then it will take you a long time to get from one side to the other. But *if* you could move through the third

dimension - *through* the paper - *then* you could move with huge apparent speed from one place to another . . .'

Spinner frowned. 'I think I see that. Is this something like wormhole travel?'

Louise hesitated. 'Not really. Wormholes are defects in our three-plus-one-dimensional spacetime, Spinner; they don't involve the higher collapsed dimensions. And wormholes are fixed. With a wormhole you can travel only from one place to another, unless you drag the termini around with you. With the Xeelee drive - we think - you can travel *anywhere*, almost at will. It's like the difference between a fixed rail route and a flitter.'

Spinner thought it over. 'It sounds simple.'

Louise laughed. 'Believe me, it's not.' She turned, distracted. 'Hey. Look,' she said, pointing to the skydome.

Spinner looked up, squinting through her spectacles against the glare of the dome. 'What?'

Louise leaned closer so that Spinner could sight along her outstretched arm. 'See? Those shadows against the dome, over there . . .'

The shadows, ten or a dozen forms, clambered across a small corner of the skydome, busy, active.

Spinner smiled. 'Howler monkeys. They've colonized the skydome. I wonder how they got up there.'

'The point is,' Louise said gently, 'they've adapted, too. Just like that parrot.'

'Another *parable*, Louise?'

Louise shrugged, looking smug.

Spinner felt, she decided, like one of Morrow's Undermen. She was no longer free; she was bowed down by the need to serve Louise's vast, amorphous project.

'All right, Louise, you've made your point. Let's go back to the nightfighter.'

For the first time, Lieserl *understood* the photino birds.

She thought of novae, and supernovae.

As the newly shining stars had settled into their multi-billion-year Main Sequence lifetimes, the Universe must have seemed a *fine* place to the

photino birds. The stars had appeared stable: eternal, neat little nests of compact gravity wells and fusion energy.

Then had come the first *instabilities.*

Red giant expansions and novae must have been bad enough. But even a nova was a limited explosion, which could leave a star still intact: survivable, by the infesting birds. A supernova explosion, however, could *destroy* a star in seconds, leaving behind nothing more than a shrivelled, fast-spinning neutron star.

Lieserl tried to see these events from the point of view of the photino birds. The instabilities, the great explosions, must have devastated whole core-flocks. Perhaps, she speculated now, the birds had even evolved a civilization in the past; she imagined huge, spinning cities of dark matter at the heart of stars - cities ripped apart by the first star-deaths.

If she were a photino bird, she wouldn't *tolerate* this.

The birds didn't *need* spectacular, blazing stars. They certainly didn't need instability, novae and supernovae, the disruption of dying stars. All they demanded from a star was a stable gravity well, and a trickle-source of proton-photino interaction energy.

She thought of Sol.

When the birds were finished with the Sun - after the superwind had blown through the wrecked System - a white dwarf would remain: a small, cooling lump of degenerate matter smaller than the Earth. The Sun's story would be over. It could expect no change, except a slow decline; there would certainly be no cataclysmic events in Sol's future . . .

But the dwarf would retain over half the Sun's original mass. And there would be plenty of dense matter to interact with, and energy from the slow contraction of the star.

The Sun would have become an ideal habitat for photino birds.

Lieserl saw it all now, with terrifying clarity.

The photino birds were not prepared to accept a Universe full of young, hot, dangerous stars, likely to explode at any moment. So they had decided to get it over with - to manage the ageing of the stars as rapidly as possible.

And when the birds' great task was done, the Universe would be filled with dull, unchanging white dwarfs. The only motion would come from the shadowy streams of photino birds sailing between their neutered star-nests.

It was a majestic vision: an engineering project on the grandest possible of scales - a project which could never be equalled.

But it was making the Universe - *the whole of the Universe* - into a place inimical to humans.

She studied the swelling core of the Sun. Its temperature climbed higher almost daily; the helium flash was close - or might, indeed, already have occurred.

The humans seemed to have assimilated the data she had sent them. A reply came to her, via her tenuous maser-light pathways.

She translated it slowly. A smiling face, crudely encoded in a binary chain of Doppler-distorted maser bursts. Words of thanks for her data. And - an invitation.

Join us, the human said.

Once again, Spinner-of-Rope sat in the cage of the Xeelee nightfighter. Arcs of construction material wrapped around her; beyond them the bloated bulk of the Sun loomed, immense and pale, like some vast ghost.

She tried to settle into her couch. Between each discontinuity-drive jaunt she'd had Mark adjust the couch's contours, but still it didn't seem to fit her correctly. Maybe it was because of the biostat sensors with which she continued to be encrusted, for each flight . . .

Or maybe, she thought dispiritedly, it was just that she was so *tired* of this bombardment of strangeness.

She fingered her chest, against which - under her suit - lay her father's arrow-head. Before her was the black bow of the Xeelee control console, with its three grafted-on waldoes. She stared at the waldo straight ahead of her - the one which controlled the hyperdrive. Superficially the waldo was just another box of metal and plastic, its telltale lights glowing warmly; but now it seemed to loom large in her vision, larger even than the corpse of the Sun . . .

'Spinner. Can you hear me?'

'Yes, Louise. I'm here.'

'Are you all right? You're in your couch?'

Spinner allowed herself a sigh of exasperation. 'Yes, I'm in my couch, just where you saw me not five minutes ago.'

Louise laughed. 'All right, Spinner, I'm sorry. I'm in the life-lounge. Look - whatever risks you take in this, I'll be right here sharing them . . .'

Now Spinner laughed. ‘Thanks, Louise; that’s making me feel a lot better.’

Louise was silent for a moment, and Spinner imagined her lopsided, rather tired grin. ‘I never was much of a motivator. It’s amazing I ever got as far as I did in life . . . Are you ready to start?’

Spinner took a deep breath; her throat was tight, and she felt light, remote - as if this were all some Virtual show, not connected to anything real.

‘I’m ready,’ she said.

There was silence; Louise Ye Armonk seemed to be holding her breath.

‘Spinner-of-Rope, if you need more time—’

‘I said, I’m ready.’ Spinner opened her eyes, settled into her crash couch, and flexed her gloved fingers. Before her, the touchpads on the hyperdrive waldo glowed.

‘Tell me what to do, Louise.’

The Sun was a brooding mass to her right hand side, flooding the cage with dull red light.

There were three touchpads in a row, all shining yellow. Without thinking about it, Spinner stabbed her forefinger at the middle touchpad.

The ambient light - *changed.*

She was aware that she had stopped breathing; even her pulse, loud in her ears inside this helmet, seemed to have slowed to a crawl.

She was staring at her gloved hand, the outstretched forefinger still touching the surface of the waldo; beyond that, in her peripheral vision, she could see the ribs of the construction-material cage. It was all just as it had been, a heartbeat before.

. . . Except that the shadows which her hand cast across the waldo box had altered, subtly.

Before, the diffuse globe of the Sun had flooded her field of view with a crimson, bloody glow, and her cage was filled with streaky, soft-edged shadows. But now the shadows had moved around, almost through a hundred and eighty degrees. As if the Sun - or whatever light source was acting now - had moved around to her left.

She lifted her hand and turned it over before her face, studying the way the light fell across her fingers, the creases in the glove material. The

quality of the light itself had changed, too; now it seemed more diffuse - the shadows still softer, the light pinker, brighter.

She dropped her hand to her chest. Through layers of suit material she could feel the hard edges of her father's arrow blade, pressing against her chest. She pushed the point of the head into her body, feeling her skin break; the tiny pinpoint of pain was like a single, stationary point of reality amid this Universe of wheeling light.

She turned her head, slowly.

The Sun had gone. Where its immense bulk had coated the sky with crimson smoke, there was only emptiness - blackness, a smearing of wizened stars.

And to her left there had appeared a wall of pinkish gas, riven by lanes of dark, its edges diffusing into blackness. It was a cloud full of stars; it must be light-years across.

She must have travelled hundreds - perhaps even *thousands* of light-years. And she'd felt *nothing*. A mere touch of a button . . .

She folded forward, dropping her head into her lap. She clutched the arrow-head to her chest, stabbing at her skin, over and over; she spread one hand against her faceplate and scrabbled at it, seeking her face. She felt her bladder loosen; warm liquid gushed through her catheter.

'Spinner-of-Rope. *Spinner* . . .'

Hands on her shoulders, shaking her; a distant voice. Her thumb was crammed into her mouth. The pain in her chest had become a dull ache.

Someone pulled her hand away from her mouth, gently.

Before her there was a square, weary face, concern showing through an uneven smile, a crop of grey, stiff hair.

'Louise . . .?'

Louise's smile broadened. 'So you're with us again. Thank Life for that; welcome back.'

Spinner looked around. She was still in her cage; the waldoes still sat on their jet-black horseshoe of construction material before her, their touchpad lights burning. But a dome of some milky, opaque material had been cast around the cage, shutting out the impossible sights outside.

Louise regarded her gravely. She hovered beyond the cage, attached by a short length of safety rope; reaching through the cage bars she held out a moistened cloth. 'Here. You'd better clean yourself up.'

Spinner glanced down at herself. Her helmet lay in her lap. Her hands were moist with spittle - and she'd *dribbled* down her chin - and where Louise had opened Spinner's suit at the chest, there was a mass of small, bleeding punctures.

'What a mess,' Spinner said. She dabbed at her chest.

Louise shrugged. 'It's no great trouble, Spinner. Although I had to move fast; I needed to get the air-dome up around you before you managed to open your

faceplate.'

Spinner picked up her helmet; reaching through the faceplate, she found an apple-juice nipple. 'Louise, what happened to me?'

Louise grinned and reached through the construction-material bars; with her old, leathery hand she touched Spinner's cheek. 'The hyperdrive happened to you. You've nothing to be ashamed of, Spinner. I knew this wouldn't be easy, but I had no idea how traumatic it would be.'

Spinner frowned. 'There was no sensation of movement *at all*. It seemed like magic, impossible. Even with the discontinuity drive there are visual effects; you can see the planets looming up at you, and the blue shift, and—'

Louise sighed and rubbed her face. 'I know. Sometimes, I think I forget that this is a Xeelee ship. It's just not designed for human comfort . . . I guess we can conclude that the Xeelee are a little tougher, psychologically, than we are.'

'But did it *work*, Louise?'

'Yes. Yes, it worked, Spinner. We crossed over *two thousand light-years* - in a time so brief I couldn't even measure it . . .'

Louise took her hand from Spinner's cheek and rested it on her shoulder. 'Spinner, I can de-opaque this dome. If you feel you want me to.'

Spinner didn't want to think about it. 'Do it, Louise.'

Louise picked up her helmet and whispered instructions into its throat mike.

The Trifid Nebula, from Earth, had once been a faint glow in the constellation of Sagittarius - as broad as the full Moon in the sky, but far dimmer; at over two thousand light-years from Earth, powerful telescopes had been needed to reveal its glorious colours. Light took fully thirty years to cross its extent.

Louise and Mark had chosen the Trifid as the first hyperdrive target. Even if the nightfighter's trajectory was off by hundreds of light-years, the Nebula should surely be an unmistakable landmark.

But the waldo had worked. Louise's programming had brought the nightfighter to within sixty light-years of the rim of the Nebula.

The Nebula was a wall, sprawled across half of Spinner's sky. It was a soft-edged study in pinks and reds. Dark lanes cut across the face of the Nebula in a rough Y-shape, dividing the cloud into three parts. The material seemed quite smooth, Spinner thought, like some immense watercolour painting. Stars shone through the pale outer edges of the Nebula - and shone, too, from within its bulk.

'This is an emission nebula, Spinner,' Louise said abstractedly. 'There are stars within the gas; ultraviolet starlight ionizes hydrogen in the Nebula, making the gas shine in turn . . .' She pointed. 'Those dark rifts are empty of stars; they're dozens of light-years long. The Nebula is called the Trifid because of the way the lanes divide the face into three . . . see? And - can you see those smaller, compact dark spots? They're called Bok globules . . . the birth places of new stars, forming inside the Nebula.'

Spinner-of-Rope turned to Louise; the engineer sounded flat, distant.

'Louise? What's wrong?'

Louise glanced at her. 'I'm sorry, Spinner. I should be celebrating, I guess. After all, the hyperdrive delivered us just where I expected to be. And I was only using the Trifid as a landmark, anyway. But - damn it, the Trifid used to be so much *more*, Spinner. The colours, all the way through the spectrum from blue, and green, all the way to red . . . There were hot, bright young stars in there which made it *blaze*.

'But now, those stars are gone. Snuffed out, or exploded, or rushed through their lifecycles; like every other star in the damn Galaxy.

'I just find it hard to accept all this. I try, but every so often something like this comes along, and hits me in the eye.'

Spinner turned to the Nebula again, trying to lose herself in its light.

Louise smiled, her face outlined by the Nebula's soft light. 'And what about you? . . . Why, Spinner, you're *crying*.'

Surprised, Spinner raised the heel of her wrist to her cheeks. There was moisture there. She brushed it away, embarrassed. 'I'm fine,' she said. 'It's just—'

‘Yes?’

‘It’s so *beautiful*.’ Spinner stared at the eagle wings of the Nebula, drinking in its pale colours. ‘Louise, I’m so lucky to be here, to *see* this. Uvarov might have sent someone else through the Locks, that first time; not me and Arrow Maker. You might have asked someone else to learn to run your nightfighter for you - and not me.

‘Louise, I might have *missed* this. I might have died without seeing it - without ever even knowing it existed.’ She looked at Louise uncertainly. ‘Do you understand?’

Louise smiled. ‘No.’ She reached into the cage and patted Spinner’s arm. ‘But once I would have felt the same way. Come on, Spinner. We’ve done what we came to do. Let’s go home.’

Spinner-of-Rope picked up her helmet. As she fastened up her suit, she kept her eyes fixed on the impossible beauty of the Trifid.

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22

Lieserl walked into the dining saloon of the *Great Britain.*

She hesitated, uncertain, in the low doorway. She was stunned by the antique beauty of the place: by its fine pillars and plasterwork, the mirrors glimmering on the walls. She was the last to arrive for this strange dinner; there were six people - three men and three women - already seated, facing each other at the centre of one of the long tables. The only light came from candles (real candles, or Virtuals?) set on the table between them. As the people talked, their faces, and the fine cutlery and glass, shone in the flickering, golden light; shadows stretched across the rest of the old saloon, turning it into a place of mystery - even romance.

One of the men turned as she came in. He rose, pushing back his chair, and walked towards her, smiling. His blue eyes were bright in a dark face.

She felt an odd, absurd, flutter of nervousness in her throat; she raised her hand to her mouth, and felt the coarseness of her flesh, the lines etched deep there. This was her first genuine human interaction in five million years . . . But how ludicrous to suffer adolescent nerves like this! She was an AI, *geologically* old, yet within mere subjective days of returning to the company of humans she had become immersed once more in the complex, impossibly difficult world of human interactions.

She felt a sudden, intense, nostalgic desire to return to the clean, bright interior of the Sun. All those millennia, orbiting the core with the photino birds, seemed like a long, fantastic dream to her now: an interval within this, the true human reality . . .

The man reached out and *touched* her arm. His flesh was firm, warm.

She cried out and stumbled backwards.

Five faces, bright with candlelight, turned towards her, and the conversation died.

No one had *touched* Lieserl in megayears.

The man leaned towards her, his blue eyes bright and mischievous. ‘I’m sorry,’ he said. ‘I couldn’t resist that. I’m Mark Bassett Friar Armonk Wu.’

She straightened herself up, primly, and glared at him. The sudden touch had left a trembling, deep in her stomach, and she was sure a flush was spreading over her cheeks, despite her age of physical-sixty. She was vividly aware - *too* aware, distractingly so - of Mark’s presence beside her.

He took her arm again, more delicately, and escorted her towards the dinner party. ‘I won’t startle you again, I promise. And I’m the only Virtual here - other than you, of course.’

‘These Virtual illusions are just too damn good sometimes,’ she said. Her voice sounded feathery - weak, she thought. It was going to take her a long time to forgive Mark Wu for that trick.

He led her to a seat and pulled it out for her - *so that was Virtual, too* - and she sat with the rest.

The woman opposite her leaned forward and smiled. Lieserl saw a square, strong face, tired eyes, a thatch of grizzled hair. ‘I’m Louise Ye Armonk,’ she said. ‘You’re welcome here, Lieserl.’

‘Ah,’ Lieserl said. ‘Louise. The leader.’

One of the men - grotesquely blind, bald, wrapped in a blanket - allowed his head to rock back on its spindle of a neck, and bellowed laughter.

Louise looked weary. ‘Lieserl, meet Garry Uvarov . . . You’ve spoken with him before.’

Louise introduced the rest: Morrow, a spindly, reticent man who, with Uvarov, had supervised her downloading through the maser link from the Interface carcass (now abandoned) inside the Sun; and two tiny, young-looking women with strange names - Spinner-of-Rope, Trapper-of-Frogs - their bare flesh startlingly out of place in the formal surroundings of the saloon. Their faces were painted with vivid, intimidating splashes of scarlet, and patches of their scalps were shaven bare. The older-looking one of the pair wore glinting spectacles and carried a crude arrow-head on a thong tied around her neck.

Lieserl was still new enough to all this to be intensely aware of her own appearance. Her hands cast soft shadows, and her brooch - of intertwined snakes and ladders - glittered in the candlelight. Looking out from the twin caverns of her eyes, she saw how the flickering of the light was reflected, with remarkable accuracy, on the blurred outlines of her own face; she knew she must look quite authentic to the others.

She smiled at Louise Ye Armonk. ‘You’ve invested a great deal of processing power in me.’

Louise looked a little defensive; she pulled back slightly from the table. ‘We can afford it. The *Northern*’s on idle. We’ve plenty of spare capacity.’

‘I wasn’t criticizing. I was *thanking* you. I can see you’re trying to make me welcome.’

Mark, sitting beside Lieserl, leaned towards her. ‘Don’t mind Louise. She’s always been as prickly as a porcupine . . .’

Spinner-of-Rope, the girl with the spectacles, said: ‘A *what*?’

‘ . . . and that’s why I divorced her.’

‘*I* divorced *him*,’ Louise Ye Armonk said. ‘And still couldn’t get rid of him.’

‘Anyway,’ Mark said to Lieserl, ‘maybe you should reserve your thanks until you’ve seen the food.’

The meal was served by autonomic ‘bots. A ‘bot - presumably a Virtual - served Mark and Lieserl.

The meal was what Louise Ye Armonk called ‘traditional British’ - just what somebody called ‘Brunel’ would once have enjoyed, on an occasion like this, she said. Lieserl stared at the plates of simulated animal flesh doubtfully. Still, she enjoyed the wine, and the sensation of fresh fruit; with discreet subvocal commands she allowed herself to become mildly drunk.

The conversation flowed well enough, but seemed a little stilted, stale to Lieserl.

During the meal, Trapper-of-Frogs leaned towards her. ‘Lieserl . . .’

‘Yes?’

‘Why are you so *old*?’

Uvarov, the crippled surgeon, threw back his head and bellowed out his ghastly laughter once more. Trapper looked confused, even distressed. Watching Uvarov, Lieserl felt herself start to incubate a deep, powerful dislike.

She smiled at Trapper, deliberately. ‘It’s all right, dear.’ She spread her hands, flexing the thin webbing between thumb and forefinger, immersing herself in the new reality of the sensation. ‘It’s just that this is how I remember myself. I chose this Virtual shell because it reflects how I still feel inside, I suppose.’

‘It’s how you were before you were loaded into the Sun?’ Spinner-of-Rope asked.

‘Yes . . . although by the time I reached my downloading I was quite a bit *older* than my aspect now. You see, they actually let me die of old age . . . I was the first person in a long time to do so.’

She began to tell them of how that had felt - of the blights of age, of rheumy eyes and failing bladders and muscles like pieces of old cloth - but Spinner-of-Rope held her hand up. Spinner smiled, her eyes large behind her glasses. ‘We *know*, Lieserl. We’ll take you to the forest sometime; we’ll tell you all about it.’

The meal finished with coffee and brandy, served by the discreet ‘bots. Lieserl didn’t much care for the brandy, but she loved the flavour of the coffee, Virtual or not.

Mark nodded at her appreciation. ‘The coffee’s authenticity is no accident. I spent *years* getting its flavour right. After I got stranded in this Virtual form I spent longer on replicating the sensations of coffee than anything.’ His blue eyes were bright. ‘Anything, except maybe those of sex . . .’

Disconcerted, Lieserl dropped her eyes.

Mark’s provocative remark made her think, however. *Sex*. Perhaps that was the element missing from this gathering of antique semi-immortals. Some had been preserved better than others - and some, like Spinner-of-Rope, were even genuinely (almost) young - but there was no *sexual tension* here. These people simply weren’t aware of each other as human animals.

She knew of Uvarov’s eugenics experiments on the forest Deck, inspired by a drive to improve the species directly. Maybe this gathering, with its mute testimony to the limitations of AS technology, was a partial justification of Uvarov’s project, she thought.

Louise Ye Armonk gently rapped her empty brandy glass with a spoon; it chimed softly. ‘All right, people,’ she said. ‘I guess it’s time for us to get down to business.’

Uvarov grinned towards Lieserl, showing a mouth bereft of teeth. ‘Welcome to the council of war,’ he hissed.

‘Well, perhaps this *is* a war,’ Louise said seriously. ‘But at the moment, we’re just bystanders caught in the crossfire. We have to look at our options, and decide where we’re going from here.

‘We’re in - a difficult situation.’ Louise Armonk looked enormously tired, worn down by the responsibilities she had taken on, and Lieserl felt herself warm a little to this rather intimidating engineer. ‘Our job was to deliver a wormhole Interface to this era, to the end of time, and then travel

back through the Interface to our own era. Well, we know that didn't work out. The Interface is wrecked, the wormhole collapsed - and we've become stranded here, in this era.

'What I want to decide here is how we are going to preserve the future of our people. Everything else - *everything* - is subordinate to that. Agreed?'

For a moment there was silence around the table; Lieserl noticed how few of them were prepared to meet Louise's cold eyes.

Morrow leaned forward into the light. Lieserl saw, with gentle amusement, how his bony wrists protruded from his sleeves. 'I agree with Louise. We have one priority, and one only. And that's to protect the people on this ship: the two thousand of them, on the Decks and in the forest. *That's* what's *real*.'

Louise smiled. 'Morrow, you have the floor. *How*, exactly?'

'It's obvious,' Morrow said. 'For better or worse, we're now the custodians of a thousand-year-old culture - a culture which has evolved in the conditions which were imposed on it during the flight. The confined space, the limited resources . . . and the constant, one-gee gravity.

'But now the flight is over. *And we took away the gravity*, virtually without notice. You know we managed to break up the Temple sieges, without much injury or loss of life. But, Louise, I can't tell you that life in the Decks has gone back to normal. How could it? Most people are barely retaining their *sanity*, let alone returning to work. No one's producing any food. At the moment we're working our way through stores, but that's not going to last long.'

Trapper pushed her face forward. 'And in the forest, too, the biota are __'

Louise held up her hands. 'Enough. Morrow has made the point. Give me a suggestion, please.'

Morrow and Trapper exchanged glances. 'If there was an Earth to return to,' Morrow said slowly, 'I'd say return there.'

'But there isn't,' Uvarov said acidly. His voice was a rasp, synthesized by some device in his throat. 'Or had you missed the point?'

Morrow was clearly irritated, but determined to make his case. 'I *know* there's no Earth.'

'So?' Louise asked.

‘So,’ Morrow said slowly, ‘I suggest we stay in the ship. We overhaul it, quickly, and retrieve more reaction mass. Then we send it on a one-gee flight.’

‘Where?’ Mark asked.

‘Anywhere. It really doesn’t matter. We could loop around the Sun in some kind of powered orbit, for all I care. The point is to restart the drive: to restore acceleration-induced gravity inside the ship. Let us - let the people in there - get back to normal again, and start *living*.’

There was silence for a moment. Then Spinner-of-Rope said, ‘Actually, in this scenario, it surely *would be* better to stay in the Solar System, on a powered orbit. The new chunk of reaction mass would be used up, in time; wouldn’t it be better to stay close enough to the Sun to be assured of being able to refuel later? . . . Even if that’s not for another thousand years from now.’

‘Perhaps.’ Louise rubbed her nose thoughtfully. ‘But I’m not sure it’s going to be viable to stay in the ship. Not in the long term.’ She sighed. ‘The dear old *Northern* did her job superbly well - she exceeded all her design expectations. And maybe she *could* last another thousand years.

‘But, in the end, she’s going to fail. It may not be for *ten* thousand years, but failure will come. And then what?’ She frowned. ‘Then, *we* might not be around to oversee any transition to another environment.’

‘There’s a more fundamental point,’ Mark said seriously. ‘The engineering - the nuts and bolts - may have survived the trip, but the *social* fabric of the *Northern* didn’t stand the strain so well. Consider the behaviour of the Planners, towards the end; their messianic visions, which had had a thousand long years to incubate, became psychotic delusions, virtually.’ He looked pointedly at Uvarov. ‘And we had one or two other little local difficulties along the way.’

‘Yes.’ Louise’s tiredness was etched into her face. ‘I guess, in the end, we didn’t do a very good job of preserving our rationality, across the desert of time we’ve traversed . . .’

Mark looked around the table. ‘People, we aren’t Xeelee. We aren’t *designed* to live with each other for centuries, or millennia. We just don’t know how to build a society that could survive, indefinitely, in a cramped, enclosed box like the ship. We’ve already failed to do so.’

‘Do you have an alternative?’ Louise asked.

‘Sure. We stay in the System. But we get out of the damn ship. We could try to colonize some of the surviving moons. They can give us raw materials for habitats, at least. We could break up the *Northern* to give the new colonies a start . . . Louise, what I’m advocating is giving ourselves *space*, before we kill each other.’

Uvarov turned his face towards the Virtual; his blind smile was like a snake’s, Lieserl thought. ‘A nice romantic thought,’ he said. ‘But not viable, I’m afraid.’

‘Why not?’

‘Because of *the helium flash*.’ Uvarov turned, disconcertingly, straight to Lieserl; his eyes were shadowed pits. ‘The flash: the coming gift from Lieserl’s cute dark matter chums inside the Sun. Our best predictions are that it will blossom from the Sun within - at the most - a few centuries.’ He swivelled his head towards Louise. ‘And after that we can expect the carbon flash, and the oxygen flash, and . . . My friends, thanks to the photino birds, the Solar System is, in practical terms, uninhabitable.’

Mark glared at the old surgeon. ‘Then come up with a better idea.’

Louise held up her hands. ‘Wait. Let’s talk around the photino birds a little.’ She glanced at Lieserl. ‘You know more about the birds than any of us. Uvarov’s projections are right, I suppose.’

‘About the continuing forced evolution of the Sun? Oh, yes.’ Lieserl nodded, feeling uncomfortable to be at the centre of attention; she was aware of the flickering candlelight playing around her nose and eyes. ‘I’ve watched the birds for five million years. They’ve maintained their behaviour pattern for all of that time; I’ve no reason to believe they are going to change now. And your observations show that every other star, as far as we can tell, is inhabited—’

Uvarov scowled. ‘*Infested*. These birds of yours - these creatures of dark matter - they are our true enemy.’

Louise regarded Lieserl. ‘Do you think he’s right about that, too?’

Lieserl thought carefully. ‘No. Not exactly. Louise, I don’t think the birds really know we are *here*. After all, we’re as marginally visible to them as they are to us.’ She closed her eyes; the illusion of inner eyelids was remarkably accurate, she thought absently. ‘I think they became aware of me, quite early . . . I’ve told you I think they tried to find ways to keep me alive. But they never showed any inclination to go seeking more of my

kind. And they never tried to communicate with me . . . Still,' she said firmly, 'I don't think it's true that the photino birds are an *enemy*.'

Uvarov laughed. 'Then what in Lethe's waters are they? They fit most of the criteria I can think of.'

Lieserl quailed from the harshness of the ruined man's tone, but she pressed on. 'I just don't think it's helpful to think of them in that way. They're doing what they're doing - wrecking our Sun - because that's what they *do*. By accelerating the stars through their lifecycles they're building a better Universe for themselves, and their own offspring, their own future.' She groped for an image. 'They're like insects. Ants, perhaps.' She glanced around the table. 'Do any of you know what I'm talking about? The birds are following their own species imperatives. Which just happen to cut across ours, is all.'

Mark nodded. 'I think your analogy is a good one. The birds don't even have to be *alive*, in our sense of the word, to accomplish enormous things - changes on a cosmic scale. From the way you've described their lifecycles, they sound like classic von Neumann self-replicating machines . . .'

Uvarov leaned forward; his head seemed to roll at the top of his thin neck. 'Listen to me. Alive or not, conscious or not, the photino birds *are* our eternal, true enemy. Because *they* are of dark matter, we are of baryonic matter.'

Louise drained her brandy snifter and poured herself a fresh measure. 'Maybe so. But for most of human history - as far as we can tell from the old Paradoxa projections, and from the accounts Lieserl has provided us - the enemy of man was seen as the *Xeelee*.'

Uvarov smiled, eerily. 'I don't deny that, of course. Why should you be surprised at such a monumental misapprehension? My friends, even the comparatively few millennia of human history before our departure from the time streams in the *Northern* were a litany of ghastly errors: the tragi-comic working out of flaws hard-wired deep into our psyches, a succession of ludicrous, doomed enterprises fuelled by illusions and delusions. I refer you to the history of religious conflict and economic ideology, for a start. And I see no reason to suppose that people got any wiser after we left. He turned his head to Mark. 'You were a socio-engineer, before you dropped dead,' he said bluntly. 'You'll confirm what I say. It seems to me that the Xeelee war - or wars - were no more than still another ghastly, epochal

error of mankind. We know that the Xeelee inhabited a higher plane, intellectually, than humans ever could: you only have to consider that remarkable craft, the nightfighter, to see that. But humans - being humans - could never *accept* that. Humans believed they must challenge the Xeelee: overthrow them, become petty kings of the baryonic cosmos.

'This absurd rivalry led, in the end, to the virtual destruction of the human species. And - worse - it blinded us to the true nature of the Xeelee, and their goals: *and* to the threat of the dark matter realm.

'It is clear to me now that there is a fundamental conflict in this Universe, between the dark and light forms of matter - a conflict which has, at last, driven the stars to their extinction. Differences among baryonic species - the Xeelee and ourselves, for instance - are as nothing compared to that great schism.'

Louise Ye Armonk frowned. 'That's a fairly gloomy scenario, Uvarov. Because if it's true—'

'If I'm correct, we face more than a simple search for safety beyond this imperilled Solar System. We may not be able to find a place to hide in this *cosmos*. Even if we were able to found some viable colony, the birds would come to seek it out, and destroy it. *Because they must.*'

Mark, the Virtual, seemed to be suppressing a laugh. '*This Universe ain't big enough for the both of us* . . . Let me sum up: everyone's dead, and the whole Universe is doomed. Well. How are we supposed to cope with an emergency like that?' He grinned.

Lieserl studied his face curiously. After their brief physical contact, she felt intensely *aware* of Mark. And yet, it disquieted her that he could speak so flippantly.

For if Uvarov was right, then it could be that the humans in this fragile old ship were the *only* people left alive in an implacably hostile Universe.

Lieserl seemed to shrink in on herself, as if cowering inside this recently rediscovered shell of humanity; she looked around at the serious, young-old faces in the candlelight. Could it be true? Was this - she wondered with a stab of self-pity - was this the final ironic joke to be played on her by a vicious fate? She had been born as an alien within her own species. Now she had returned - been welcomed, even - and was it only to find that the story of man was finished?

‘I’m sorry,’ Mark was saying; he seemed deliberately to calm down. ‘Look, Uvarov, what you’re saying sounds absurd. Impossibly pessimistic.’

‘Absurd? Pessimistic?’ Uvarov swivelled his blind eyes towards Mark. ‘You have sight; I do not. Show me a part of the sky free from the corruption wrought by these dark-matter crows.’

Mark’s grin grew uncertain. ‘But we can’t escape the *cosmos*.’

Now Uvarov smiled, showing the blackness of his toothless mouth. ‘Can’t we?’

Lieserl watched Uvarov with interest. His analysis of the *Northern*’s situation had a devastating clarity. He seemed to be prepared to address issues with unflinching honesty - more honestly than any of the others, including herself.

Perhaps this was why Louise Armonk kept Uvarov around, Lieserl speculated. As a human he was barely acceptable, and his sanity hung by a thread. But his *logic* was pitiless.

Spinner-of-Rope folded her bare arms on the tablecloth. ‘So, Doctor, you know better than all the generations of humans who ever lived.’

Uvarov sighed. ‘Perhaps I do, my dear. But then I have the benefit of hindsight. ’

‘Then tell us,’ Louise said. ‘You said humans were blind to the goals of the Xeelee. What *were* the Xeelee up to, all this time?’

‘It’s obvious.’ Uvarov swept his empty eyes around the table, as if seeking a reaction. ‘The Xeelee are the dominant baryonic species - the *baryonic lords*. And they have led the fight, the climactic battle for the Universe, against these swarms of dark-matter photino birds. They have been striving to preserve *themselves* in the face of the dark matter threat.’

‘And the human wars with the Xeelee—’

‘—were no more than an irritation to the Xeelee, I should judge. But a dreadful, strategic error by humanity.’

The group fell into silence; Lieserl noticed that the eyes of Trapper-of-Frogs had become huge with wonder, childlike. She stared into the candle flames, as if the truth of Uvarov’s words could be found there.

‘All right,’ Louise said sharply. ‘Uvarov, what I need to understand is where this leaves us. What should we actually *do*?’

There was a gurgling sound from within Uvarov’s wrapping of blankets; Lieserl, uneasily, realized that his chair was feeding him as he spoke.

‘What we should do,’ he said, ‘is obvious. We cannot possibly defend ourselves against the photino birds. Therefore we must throw ourselves on the mercy of our senior cousins - we must seek the protection of the baryonic lords, the Xeelee.’

Mark laughed. ‘And how, exactly, do we do that?’

‘We have evidence that the Xeelee are constructing a final redoubt,’ Uvarov said. ‘A last defence perimeter, within which they must intend to fall back. We must go there.’

Louise looked puzzled. ‘What evidence? What are you talking about?

Mark thought for a moment. ‘He means the Great Attractor . . .’ He summarized the findings of the anomalous gravity-wave emissions from the direction of the Attractor.

Louise frowned. ‘How do you know that’s anything to do with the Xeelee?’

‘Well, it could make sense, Louise; from the gravity waves we’ve picked up, we know *something* is going on at the Attractor site. Some kind of activity . . . something *huge*. And there’s no sign of life anywhere else . . .’

Uvarov nodded, his head jerking. ‘The Attractor is an immense construction site, perhaps: the last great baryonic project. We can even guess at its nature.’

‘Yes?’ Louise snapped.

‘We know their technology was based on the manipulation of spacetime,’ Uvarov said. ‘We have the evidence of the starbreaker - gravity-wave weapons - and the domain-wall defect drive of the nightfighter. I believe the object in Sagittarius, whatever it is, is a construct.’

‘A construct of what?’

‘Manipulated spacetime,’ Uvarov said.

‘It’s logical, Louise,’ Mark said. ‘Think about it. Only through spacetime effects, including gravitation, can the Xeelee interact with the photino birds. So they’ve evolved weapons and artifacts based on the manipulation of spacetime: the nightfighter domain-wall drive, the starbreaker . . .’

‘*The Ring*,’ Lieserl breathed. ‘Perhaps this - the Great Attractor - is the Ring. The Xeelee’s greatest, final Project . . . ‘*Is it possible*? ‘Dr Uvarov, have you found the Ring?’

Garry Uvarov turned to her. ‘Perhaps.’

Mark was nodding. ‘Maybe you’re right . . . We’ve evidence that the dark matter creatures know about the activity in Sagittarius, too.’ To Lieserl he said, ‘We’ve seen streams of them coming and going from the Sun and heading in the direction of the Attractor . . . as if that is the focus of *their* activities, as well.’

Uvarov smiled. ‘It is the final battlefield.’

‘How far?’ Lieserl asked.

Louise grimaced, her mouth twisting. ‘To the Great Attractor? Three hundred million light-years . . . It’s no walk around the block.’

‘But we could get there,’ Mark said. Lieserl noticed that his tone was flat, more distant than before. ‘We have the nightfighter hyperdrive. We’ve no evidence that the hyperdrive is distance-limited. Spinner’s flights have already man-rated it . . .’

Lieserl saw how Spinner-of-Rope shrank, subtly, away from the table, and dropped her small hands into her lap, her round face expressionless.

Louise Ye Armonk was frowning. ‘We’d have to find a way of transporting our people, obviously.’

Mark spread his hands. ‘Surely that’s possible We may have to detach the lifedome from the *Northern*, fix it to the nightfighter somehow . . .’

Louise nodded. ‘We’d have to strengthen the dome internally, though . . . Obviously we’ll need co-operation from the Decks. Morrow - will we get it?’

Morrow leaned forward, into the light, to reply.

Lieserl folded her hands on the table and tried to stop them trembling. She let the rest of the conversation, as it delved into detail, wash over her.

The decision seemed to have been made, then, almost by default. She examined it in her own mind.

Had there been any alternative? Given Uvarov’s devastating logic, probably not.

But Uvarov’s logic implied that she - Lieserl - was going to end her own long, strange life at the centre of all myths - myths which had persisted for most of mankind’s sad history.

She was going to the Ring . . .

PART IV
TRAJECTORY: SPACELIKE

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23

From the upper forest Deck to the loading bay at the base, lights blazed from the *Northern*'s battered lifedome. The human glow flooded over impassive Xeelee construction material, evoking no reflection.

Spinner-of-Rope sat in her cramped pilot's cage. Her helmet was filled with urgent chatter relayed from the lifedome.

Her hands fidgeted, plucking at the seams of her gloves; they looked like nervous, fluttering birds, she thought. She rested the hands deliberately against the material of her trousers, stilling them. The crew *still* weren't ready. How much of this waiting did they think she could endure?

Behind her, the smooth lines of the nightfighter's discontinuity-drive wings swept across space, outlined in blood-red by the bloated hulk of the Sun. The lifedome of the *Great Northern* - severed from its columnar spine - had been grafted crudely onto the shoulders of the nightfighter, pinned within a superstructure of scaffolding which embraced the lifedome and clasped it to the nightfighter. Behind the dome a GUTdrive power source, cannibalized from the abandoned *Northern*, sat squat on the nightfighter, cables snaking from it and into the dome. And, cradled within the attaching superstructure, Spinner could see the short, graceful profile of the *Great Britain:* the old sea ship, preserved from abandonment once more by the sentimentality of Louise Ye Armonk, was a dark shadow against the lifedome, like some insect clinging to its glowing face.

The lifedome was a mile-wide encrustation on the cool morphology of Xeelee technology; it dwarfed the Xeelee ship which carried it, looking like a grotesque parasite, she thought.

Spinner closed her eyes, trying to shut out the surrounding, pressing universe of events. She listened to the underlying wash of her own, rapid, breathing. Under her helmet her spectacles pinched the bridge of her nose with a small, familiar discomfort, and she could feel the cool form of her father's arrow-head against her chest. Clinging biostat telltales clung to her flesh, sharp and cold, but the little probes had at least become familiar: not nearly as uncomfortable as she'd found them at first. The environment suit smelled of plastic and metal, and a little of herself; but there was also a sparkle of orange zest, from one of the helmet nipples.

' . . . Spinner-of-Rope.'

The voice emerged from the background lifedome babble like the clear voice of an oboe within an orchestra. (And *that*, she thought, was a metaphor which wouldn't have occurred to her in the days before she'd poked her head out of the forest.)

'I hear you, Louise.'

'I think we're ready.'

Spinner laughed. 'Are you joking? I can't imagine you all sounding *less* ready.'

Louise sighed, clearly irritated. 'Spinner, we're as ready as we're ever going to be. We've been working on this for a year now. If we wait until every bolt is tightened - and until every damn jobsworth in the Decks, every antique anal-retentive on every one of Morrow's damn launch committees, is prepared to give his or her grudging acquiescence - we'll still be sitting here when the Sun goes cold.'

'It's a little different from your old days, Louise,' Spinner said ruefully. Spinner had seen images of the *Northern*'s first launch - the extravagant parties that had preceded it, the flotilla of intraSystem craft that had swirled around the huge GUTship as it had hauled itself out of the System.

Louise grunted. 'Yeah, well. I guess those days are gone. Things are a little more seat-of-the-pants now, Spinner.'

Yes, Spinner thought resentfully, *but the trouble is it's my seat; my pants.*

Louise said, 'We're ready technically, anyway, according to all of Mark's feedbacks. We've laid the co-ordinates of the flight into your waldo systems . . . all we can do now is see if they work.'

'Right.' Sourly, Spinner asked, 'Shall I do a countdown? You could relay it through the Decks; it might be fun. *Ten - nine—*'

'Come on, Spinner. Don't play games. It's time to *do* it. And, Spinner —'

Spinner stared at the Sunlight. 'Yes?'

' . . . Be *prepared*.'

Spinner's resentment grew. She knew what *that* meant. If anything went badly wrong with this first, full hyperdrive flight - so bad that it hadn't been predicted by the endless Virtual scenarios, so bad that the automatics couldn't cope - then it was going to be up to her, Spinner-of-Rope, and her famous seat-of-the-pants. And that was why she was still here, in this damn

open cage: because Louise and Mark had failed to find a way to automate out that human element.

On her reactions and quick thinking, she knew, could depend - not just her own life, and the lives of her friends, the safety of the forest - but the future of the species.

I should have stuck to rope-spinning, she thought gloomily.

She reached out towards her hyperdrive waldo. She found herself staring at her own hand and arm, becoming aware of the enormity of the action she was about to take. The light of the dying Sun flooded the cage in shades of blood-red; gaudy golden highlights glimmered from the material of her glove.

She was filled, suddenly, with a profound sense of melancholy. She stifled a cry; the mood was so powerful it was almost overwhelming . . .

And the flood of emotion was coming from outside her. It came from her *companion*, she realized; her silent, invisible companion, here in the cage . . .

Louise sounded tense, almost unbearably so. ‘Spinner? We’re waiting.’

Spinner-of-Rope looked around at the empty sky of the Solar System: at the ruin of the Sun, the glistening Jovian accretion disc. Despite the alienating devastation, it was strange to think that she would be the last human to witness this aching, echoing, cathedral of space and history. ‘Louise - no one’s ever going to come back here, are they?’

‘To the Solar System? No,’ Louise replied briskly.

‘It doesn’t seem right,’ she said slowly.

‘What doesn’t?’

‘That we should simply *leave* like this. Louise, we’re the last humans. Shouldn’t we—’

Louise laughed. ‘What? Nail a plaque to Callisto? Make a speech? “Last one to leave, turn off the lights”?’

‘I don’t know, Louise. But—’

‘Spinner.’ It was always very obvious when Louise was forcing herself to be patient. ‘*It’s over*. Just push the damn button.’

Spinner-of-Rope closed her hand around the waldo.

Sunlight imploded.

Spinner-of-Rope was switched into darkness, into a sea of shadows which flooded the cage. She glanced down at her lap. The only illumination

was a dim crimson glow - far less brilliant than Sol's - which barely revealed the outlines of her own body.

The hyperdrive transit was as sudden and seamless as the test runs. There was no internal sense of motion at all: merely a *lighting change*, as if all of this were no more than some shallow Virtual stunt.

She twisted in her couch. Behind her, the lifedome still sat on the frail-looking shoulders of the Xeelee craft, apparently undamaged; yellow human light, aping lost Sol, still blazed from a hundred sources, pale against the emptiness of space.

And beyond the lifedome there was a star, near enough to show a globe - as red as Sol but evidently much dimmer, cooler. The star provided the little light available. Beyond the star's glowing limb, six distant stars - a little brighter than the average - trailed across the sky in a zigzag shape. The star at one end of the compact constellation, ruby red, shone *through* the tenuous outer atmosphere of the nearby star globe.

The more remote constellations were an array of crimson and yellow spread across the sky. They were unchanged, as far as she could tell. Well, that was no surprise: she knew Louise hadn't planned to come far on this first jaunt.

'How are you, Spinner-of-Rope?'

'Fine,' Spinner said briskly. 'As I'm sure you know better than I do, thanks to Mark's telltales.'

Louise laughed. 'I've learned never to trust these damn gadgets. How did the trip feel?'

'As good as ever. As bad as ever . . . I take it we all survived.'

'I'm just checking my summaries. No structural damage, as far as I can see. One case of shock—' She snorted. 'A man who fell out of your big kapok tree, Spinner-of-Rope, when the Sun disappeared. The fool floated around until he could be snagged and hauled in. As we hoped, the nightfighter's domain-wall inertial shielding protected the whole of the lifedome from any side-effects of the jump . . . Spinner, I don't think many people in the Decks have even *realized* we've jumped.'

'Good. I guess it's better that way.' Spinner-of-Rope stared around the sky. 'Louise, I thought the Solar System was depressing enough. But this system is a *tomb*.'

‘I know, Spinner. I’m sorry. But it is in our flightpath. Spinner, we’re going to head out of the plane of the Galaxy, in the direction of the Centaurus constellation: towards the Great Attractor . . .’

‘The Xeelee Ring.’

‘If that’s what it is, yes. And this star lies in Centaurus also.’

The main stars of the Centaurus constellation were ranged over distances from four light-years to five hundred light-years from the Sun. *Northern*, piggy-backing the Xeelee nightfighter, was going to move, in a rough straight line, out through this three-dimensional layout - and then beyond, out of the Galaxy and towards the Great Attractor itself.

‘Spinner, would you believe I decided we should come here, on the first hop, for sentimental reasons?’

‘Sentimental? About this place? Are you kidding?’

‘Spinner, that dull globe is Proxima Centauri: the nearest star to the Sun, less than four light-years out. When I was a kid, growing up on Earth, we’d barely reached the stars with the first GUTships. Systems like Proxima were places of wild romance, full of extraordinary adventure and possibility. Paradoxa’s sombre warnings of implacably hostile alien species Out There Somewhere just added to the allure for kids like me . . . I felt I had to get out here and see for myself.’

The *presence*, in the cage with her, seemed amused at this - even satisfied, Spinner thought.

Spinner grunted and picked at the material of her suit. ‘Well, you made it to Proxima at last. And I’m touched by these childhood reminiscences,’ she said sourly.

You’re too harsh on her, Spinner-of-Rope . . .

Spinner went on, ‘This Proxima looks like a red giant. So I guess the photino birds have already done their work here . . .’

‘No,’ Louise said. ‘Actually, Spinner, Proxima is a red *dwarf* . . . It’s a Main Sequence star, quite stable.’

‘Really?’ Spinner-of-Rope twisted in her seat and stared into the dull disc of Proxima. ‘You mean it’s *always* been like this?’

Louise laughed. ‘I’m afraid so, Spinner. It’s just a lot less massive than the Sun, and so has always been much dimmer - twenty thousand times less luminous than the Sun, in fact. The photino birds didn’t need to turn it cool

and red, like the Sun; Proxima has *always* been a dwarf. Stable, and harmless - and quite useless.'

'Useless for us. For baryonic life. But maybe not for the birds.'

'No,' Louise said. 'I guess a red dwarf is the ideal stellar form, for them: the model towards which they are guiding every damn star in all the galaxies. Of course Proxima has its moments: it's quite a brilliant flare star - a UV Ceti type. It can vary in brightness by up to a magnitude . . .'

'It can?' For a few seconds Spinner studied the bland crimson disc. 'You want we should wait around and see if it does something exciting?'

'No, Spinner. Anyway, I suspect the photino birds will have put a stop to such frivolities by now . . . *Oh*. One thing. Spinner-of-Rope, turn around.'

Loosening her restraints, Spinner twisted in her seat. 'What now?'

'Spinner, do you see that constellation just to the right of Proxima's disc?'

Louise must mean the jagged row of six stars behind Proxima, Spinner decided. 'Yes. What about it?'

'From Earth, that constellation used to be called Cassiopeia: named after the queen of Cepheus, the mother of Andromeda . . .'

'Save the fairy tales, Louise,' Spinner growled.

'But from here, the constellation looks different. From here, the pattern's distinctive W-shape is spoiled a bit - by the addition of that bright red star at the left hand end of the row.'

Spinner stared; the star was a ruby jewel glimmering through the hazy outer layers of Proxima.

'The first colonists of Proxima - or rather, of the Alpha system, of which Proxima is a part- called the new constellation the Switchback.

'Spinner, that extra star is the Sun. *Our* Sun, seen from Proxima. Another jump and Sol will be invisible; Spinner-of-Rope, yours are the last human eyes ever to look at Sunlight . . .'

Giant Sol glowed through the crimson velvet of Proxima; Spinner stared at it, trying to make out a disc, until her eyes began to ache.

At last she tore her gaze away. 'Enough,' she said. 'Come on, Louise; no more of the past.'

'All right, Spinner . . .'

Spinner closed her hand around the waldo once more.

. . . And the brooding globe of Proxima was replaced, abruptly, without any internal feeling of transition, by a new star system. This was another red star - huge, ragged-edged - but this time with a companion: a smaller yellow star, a point of light, barely a diameter away from the red globe. The giant was pulled into an elliptical shape by the dwarf companion, and Spinner thought she could see a dim bridge of material linking the two stars, an arc of red-glowing star stuff pulled out of the giant.

‘ . . . Spinner?’

‘Yes, Louise. I’m still here. You’re really showing me the sights, aren’t you?’

‘This is *Menkent* - Gamma Centauri. We’re further through the Centaurus constellation: a hundred and sixty light-years from Sol, already. Menkent used to be a glorious A-class binary . . . But the photino birds have been at work. Now, one of the companions is going through its giant stage, and the other has already been reduced to a dwarf. Disgusting. Depressing.’

Spinner-of-Rope studied the twin stars, the lacy filaments of crimson gas reaching out of the giant to embrace its dwarf twin. ‘Depressing? I don’t know, Louise . . . It’s still beautiful.’

Yes, Spinner-of-Rope. And this is the last star we’ll visit that was significant enough to be named by Earth-bound astronomers, before spaceflight. Another gloomy little milestone . . .

‘Don’t you get morbid too,’ Spinner said.

‘Spinner?’

‘Nothing. Sorry, Louise.’

‘All right, Spinner, we’ve established everything is functioning well enough. I’m going to cut in the main navigation sequence now, and we’ll try some major jumps . . . Do you think you’re ready?’

Spinner closed her eyes. ‘I’m ready, Louise.’

‘Now, I know it’s going to be hard, but it will help if you keep in mind an understanding of what you’re going to see. We’re heading out of the Galaxy, at around twenty degrees below the plane of the disc. We’re going to attempt thirty-five light-years every jump - and we’ll be trying for a jump every second. At that rate, we should cover the hundred and fifty million light-years to the Attractor in—’

‘—in around fifty days. I *know*, Louise.’

‘I’m in the forest, Spinner. I’m looking out through the skydome, with Morrow and Uvarov, Trapper-of-Frogs, a few of the others. So you’re not alone, out there; we can see what you can see, Spinner—’

‘Another pep-talk? I know, Louise. I *know*.’ She sighed. ‘Louise, you’re a great engineer, and a strong human being. But you’re a damn awful *leader*.’

‘I’m sorry, Spinner. I—’

‘Let’s *do* it.’

Impulsively, Spinner slapped her hand down on the waldo.

—and the brooding coupled stars of Menkent were replaced, instantaneously, by another binary pair. This time the stars - twin red giants - seemed more equally matched, and a bridge of cooling, glowing material linked them. A wide, spreading spiral of dim gas was curled tightly around the giants, and—

—before she had time to think about it here was still another binary pair, this time much further from the ship, with a bright, hot blue star traversing the decaying hulk of a dim red giant. She saw how the giant hung behind the blue star like smoke behind a diamond—

—when she was whisked away yet again and now, before her, hung a softly shimmering globe of light: a planetary nebula, she recognized, the expanding corpse of a red giant, blown apart by its bird-induced superwind, but before—

—she could wonder if Sol would one day look like this, the nebula had gone to be replaced by an anonymous, distant star field which—

—vanished, because now she was surrounded by a dim, red smog; she was actually *inside a* giant star, she realized, *inside* its cooling outer flesh and—

—that was gone too, replaced by a huge, ragged nebula - *a supernova site?* - which—

—imploded and—

—a star loomed at her, swollen, ruddy, achingly like Sol, but not Sol, and—

—*and - and - andandand*—

The stars were a huge, celestial barrage around her head. Beyond the immediate battering of light, the more distant constellations slid across space, elegant, remote, like trees in a forest.

Spinner sat rigidly in her crash-couch, letting the silent explosions of starlight wash across her cage.

. . . And, abruptly as it had begun, the barrage of starfields thinned out, diminished, vanished. Before the nightfighter now was only a uniform, restful darkness; a soft pink light, from some source behind her, played over the surfaces of the cage.

It's over.

Spinner-of-Rope felt herself slump in her couch. She felt as if her bones had turned to water. She cradled her visor in her glove, shutting out the Universe, and sucked on an orange juice nipple; the sharp, homely taste seemed to fill up her head.

She felt herself retreat into the small cosmos of her own body once more, into the recesses of her own head. *It's comfortable in here*, she thought groggily. *Maybe I should never come out again . . .*

'Spinner-of-Rope.' Louise's voice, sounding very tender. 'How are you feeling?'

Spinner sucked resentfully on her orange juice. 'About as good as you'd expect. Don't ask stupid questions, Louise.'

'You did bloody well to withstand that.'

Spinner grunted. 'How do you know I *did* withstand it?'

'Because I didn't hear you scream. And because my telltales are showing me that you aren't chewing the inside of your helmet. And—'

'Louise, I knew what to expect.'

'Maybe. But it was still *inhuman*. A Xeelee might have enjoyed that ride . . . People, it seems, need to work on a smaller scale.'

'You're telling me.'

' . . . When you're ready, take a look behind you.'

Spinner lifted her face from the nipple. The pinkish light from the source behind her still played over the surfaces of the waldoes, the crumpled suit fabric over her thighs.

She loosened her restraints, carefully, and turned around.

There was a *ceiling* of light above her. It was an immense plane of curdled smoke: lurid red at its heart and with violent splashes of colours - yellow and orange and blue - further out. The plane was foreshortened, so that she stared across ridged lanes of gas towards the bulging, pregnant centre. Smoky gas was wrapped around the core in lacy spirals of colour.

The plane of light receded, almost imperceptibly slowly, from the ship. The plane was a roof, and the nightfighter - with its precious burden of people, and all the hopes of humanity - was a fly, diving down and away from that immense surface.

‘Louise, it’s *beautiful*. I had no idea . . .’

‘Do you understand what you’re seeing, Spinner-of-Rope?’ Louise’s voice sounded fragile, as if she were struggling with the enormity of what she was saying. ‘Spinner, you’re looking up at our Galaxy - *from the outside*. And that’s why that barrage of stars has finished . . . Our Galaxy’s disc is only around three thousand light-years thick. Travelling obliquely to the plane, we were out of it in just a couple of minutes.’

The nightfighter had plunged out of the Galaxy at a point about two-thirds of the way along a radius from the centre to the rim. The ship was going to pass under the centre of the disc; that bloated bulge of crimson light would look like some celestial chandelier, thousands of light-years across, hanging over her head. Spiral arms - cloudy, streaming - moved serenely over her head. There were blisters of gas sprinkled along the arms, she saw, bubbles of swollen colour.

‘Spinner, the disc is a hundred thousand light-years across. It will take us just fifty minutes to traverse its width . . .’

Spinner heard Louise turn away and mumble something.

‘What was that?’

‘Your kid sister. Painter-of-Faces. She asked why we aren’t seeing relativistic distortion.’

Spinner grinned. ‘Tell her not to bother us with such stupid questions.’

‘We aren’t all hardened space pilots like you, Spinner-of-Rope . . .’

There was no relativistic distortion - no starbow, no red or blue shift - because the nightfighter wasn’t moving *through* the Universe. The ‘fighter was hopping from point to point - like a tree frog, Spinner thought, leaping between bromeliads. And at the end-point of each jump, the ship was stationary - just for a second - relative to the Galaxy.

So, no blue shift.

But the nightfighter was falling out of the Galaxy at an effective velocity of millions of times lightspeed. It was the *frequency* of the jumps which gave Spinner this illusion of constant, steady motion.

It was working out, just as planned.

We’re *making* it, Louise,’ Spinner said. ‘We’re making this *happen*.’

‘Yes . . . *But—*’

Spinner let out a mock groan. ‘But now you’re going to tell me how things just ain’t what they used to be, *again*, aren’t you?’

‘Well, it’s true, Spinner,’ Louise said angrily. ‘Look at it . . . Even from this distance, outside the Galaxy, you can see the handiwork of those damn photino birds.’

The Galaxy contained two main classes of stars, Louise told Spinner. *Population I* stars, like the Sun, had evolved in the hydrogen-rich spiral arms, away from the centre. Some of these - like the blue supergiants - had been hundreds of times larger than the Sun, blazing out their energy in a short, insanely profligate youth. Population I stars tended to explode, enriching the interstellar medium - and later generations of stars - with the complex products of their nucleosynthesis.

By contrast, *Population II* stars had formed in regions where hydrogen fuel was in scarce supply: in the old regions close to the core, or in the clusters outside the main disc. The II stars were more uniform in size, and - by the era of the earliest human astronomy - had already been old, characterized by jostling herds of red giants.

‘Look at that disc,’ Louise snapped. ‘I don’t suppose the damn birds had to do much to the dull, stable Population IIs; those things were half-dead already. But look - oh, look at the spiral arms . . .’

Spinner saw how ragged the spirals were, disrupted by the blisters of yellow-red light which swelled across the lanes of dust.

‘Those blisters are supernova remnants,’ Louise said bitterly. ‘Spinner, not every star would respond as peacefully to the photino birds’ engineering as did our poor old Sun. A lot of the more spectacular, and beautiful, Population I stars would simply explode, tearing themselves apart . . . Probably the birds set off chain reactions of supernovae, with the wreckage of one star destabilizing another.’

Spinner stared up at the wreckage of the disc, the muddled spiral arms.

. . . We’re already forty thousand light-years below the disc, Spinner, her companion said. *The light you’re seeing now left the stars forty millennia ago . . . Think of that. Forty thousand years before my birth, humans were still shivering on the edges of glaciers, making knives out of bits of stone. And the further we travel, with every second, the light is*

getting older: Spinner-of-Rope, you're taking us through a hail of ancient light . . .

Spinner laughed. 'You should have been a poet.'

'What?'

' . . . Tell me what's coming next, Louise.'

'All right. Spinner, do you know what *a globular cluster* is?'

Spinner frowned. 'I think so.' She closed her eyes. 'A stable ball of stars - perhaps a hundred thousand of them - orbiting around the main disc, in the Galactic halo.'

'Right,' Louise said. 'They are Population II stars. And one particular cluster, called Omega Centauri, was one of the brightest clusters visible from old Earth.'

Spinner thought that over. '*Omega Centauri*. That name means it was in the line-of-sight of the Centaurus constellation.'

'Right.'

'You mean—'

'We're heading right for it. Keep your eyes tight shut, Spinner-of-Rope.'

Spinner turned, and looked ahead.

Beyond the fragile cage, giant stars ballooned at her, dazzling her with their billowing silence.

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24

Upright on their zero-gee scooters, Lieserl and Milpitas descended into the deep loading bay at the base of the *Northern*'s lifedome. Above Lieserl the maintenance bulkhead at the base of Deck Fifteen spread out, an improbable tangle of ducts, cables and tree roots.

From the corner of her eye, Lieserl watched Milpitas curiously. He looked down at the drop beneath his feet with undisguised dread. Milpitas had been a starship traveller for a thousand years, but he was so obviously a gravity-well dweller. He visibly suffered in this zero-gee environment, his instincts quite unadapted to the fact that even if his scooter failed completely he'd simply drift through the air, perfectly safely.

Beneath the thick layer of dank, empty air into which she was descending, the base of the *Northern*'s lifedome had been turned transparent. The base appeared to Lieserl as a pool of cool darkness - and there, pinned against the underside of the lifedome base, like some immense insect immersed in a pond, was the slender form of the Xeelee nightfighter which bore them through space. Its sycamore-seed wings looked somehow darker even than the emptiness between stars.

The Planner turned to her stiffly and smiled. 'You look - uncomfortable - on that scooter.'

She suppressed a grin. *Me*? 'Uncomfortable? Not really.' She clicked her fingers and her scooter disappeared. She smiled at Milpitas, feeling mischievous. She did a back flip in the air, rolling twice; the clear floor beneath her wheeled across her vision.

She finished up falling alongside Milpitas once more. 'I don't feel uncomfortable, ' she said. 'Just - well, a little foolish. Sometimes I feel these Virtual masks Mark sets up for me are a little forced.'

Milpitas had turned away from her antics, his face pale; he gripped the handles of his scooter so hard his knuckles were white.

Hastily she called subvocally for the return of her Virtual scooter. I'm sorry,' she said, sincerely. 'I guess I shouldn't have done that.'

She saw how the sweat glistened on the patchwork scars of his brow, but he determinedly held himself erect on his scooter. 'Don't apologize,' he said primly. 'We're here on an inspection tour . . . to consider the disposition of *the ship*, not my well-being.'

So, after that brief moment of human frailty, Milpitas was back in his shell. She turned away, vaguely disappointed.

They were approaching the base of the loading bay, now. Lieserl could see the twin small jets of her scooter reflected in the clear floor; like attracting stars, she converged with her own image - in fact it was an image of an image, she thought wryly; the processors which sustained her were doing a good job with their Virtual reality creation today.

Milpitas, with a tense flick of his bony, scarred wrist, levelled off and began to sail parallel to the surface. Lieserl followed, a few feet behind.

Beneath the dome base, the Xeelee nightfighter spread its construction-material wings, huge, dormant.

‘Good morning, Spinner-of-Rope,’ Louise said.

Spinner stretched. Allowing herself to wake up slowly, she sucked fortified fruit juice from her helmet nipples and let the environment suit clean her skin with blasts of ultrasonics; she felt a warm trickle of urine enter her catheter.

She grunted in reply to Louise.

It was Spinner’s tenth day in the nightfighter cage.

She loosened her restraints and looked around - and found herself staring into intergalactic emptiness. In the distance were patches of muddy light which could have been galaxies, or clusters of galaxies - so remote that even at the ‘fighter’s immense speed of three million light-years a day, she could make out no discernible movement.

Spinner slumped back into her couch. ‘Lethe. Another day in the middle of this grey, lifeless desert,’ she said sourly.

Louise - watching, Spinner knew, from her encampment on the *Northern*’s forest Deck - laughed, sounding sympathetic. ‘But today should be a little more interesting than most, Spinner-of-Rope. We’ve reached a milestone. Or rather, a *mega-light-year-stone* . . .’

‘We have?’

‘After ten days, we’ve come thirty million light-years from Sol. Spinner, we’ve reached the centre of the Virgo Cluster - the supercluster of galaxies of which our Galaxy is a member. Way behind you is a little patch of light: that’s the Local Group - three million light-years across, the small cluster dominated by our Galaxy and the Andromeda galaxy. And to your left, at about eleven o’clock, you’ll see the centre of the Virgo Cluster itself: that

massive group of several thousand bright galaxies. They *used* to be bright, anyway . . .’

Spinner made out the central galaxy group. It was a grey, grainy cloud of light. ‘Fascinating.’

‘Oh, come on, Spinner. Look, we’re making an epic journey here - we’re travelling so far we’re making progress through the large-scale structure of spacetime. You can’t fail to be - well, *uplifted*.’

‘But I can’t *see* any of it, Louise,’ Spinner said fretfully.

Louise was silent for a moment. Then she said, ‘All right, Spinner. I’ll *show* you where you are.’

A ball of brilliant white light, expanding rapidly to about a foot across, appeared a few yards in front of the ‘fighter cage.

Spinner slouched in her couch and folded her arms. ‘Another educational Virtual display, Louise?’

‘Bear with me, Spinner-of-Rope. Look at this. Here’s the Universe, expanding from the Big Bang - as it was after perhaps three hundred thousand years. The cosmos is a soup of radiation and matter - a mixture of the dark and light variants.

‘The temperature is still too high for atoms to form. So the baryonic matter forms a plasma. But plasma is quite opaque to radiation, so the pressure of the radiation stops the matter from clumping together. There are no stars, no planets, no galaxies.’

Abruptly the Virtual Universe expanded to double its size, and turned clear; a flash of light flooded out over Spinner’s face, making her blink.

‘Now the temperature has fallen below three thousand degrees,’ Louise said. ‘Suddenly the electrons can combine with nuclei, to form atoms - and atoms *don’t* interact strongly with photons. So the Universe is transparent for the first time, Spinner. The radiation, free to fly unhindered across space, will never interact with matter again. And in fact we can still see the primordial radiation today - if we care to look, its wavelength greatly stretched by the expansion of the Universe - as the cosmic background microwave radiation.

‘But the key point is, Spinner, that after this decoupling the radiation could no longer stop the matter from clumping together.’

The model Universe was now a cloud of swarming, jostling particles.

‘It looks like a mist,’ Spinner said.

‘Right. Think of it as like a dew, Spinner. It’s spread out thin and uniform: on average there’s one hydrogen atom in a space the size of one of our transport pods. And at this point the expansion of the Universe is pushing the dewdrops still further apart. But now, the structures of matter - the galaxies, the clusters and superclusters of galaxies - are ready to coalesce; they’ll condense out like dewdrops on a spider web.’

Spinner smiled. ‘Some spider. But where’s the web?’

The ball of mist was filled, now, by a fine tracery of lines; the toy Universe looked like a cracked, glass sphere. ‘*Here’s* the web, Spinner,’ Louise said. ‘You’re looking at *cosmic strings*. Strings are defects in spacetime—’

‘I know about string,’ Spinner said. ‘The Xeelee used strings - and domain walls - in the construction of the nightfighter.’

‘Right. But *these* strings formed naturally. They are remnants of the phase transitions of the early Universe, remnants left over after the decomposition of the GUT unified superforce which came out of the singularity . . . Cosmic strings are residual traces of the ultrahigh, symmetric vacuum of the GUT epoch, embedded in the “empty space” of our Universe - like residual lines of liquid water in solid ice. And the strings are superconducting; as they move through the primordial magnetic fields, huge currents - of a hundred billion billion amps or more - are induced in the strings . . .’

The strings writhed, like slow, interconnected snakes, across space. The particles of mist, representing the uniform matter distribution, began to drift towards the strings. They coalesced in narrow columns around the strings, and in thin sheets in the wake of the strings.

‘It’s beautiful,’ Spinner said.

‘The strings are moving at close to lightspeed,’ Louise said. ‘They leave behind them flat wakes - planes towards which matter is attracted, at several miles a second. Structure starts to form in the wakes, so we get a pattern of threads and sheets of baryonic matter surrounding voids . . .’

Now the baryonic matter, coalescing around the string structure, imploded under its own gravity. Tiny Virtual galaxies - charming, gem-like - twinkled to life, threaded along the webbing of cosmic string.

‘And there’s more,’ Louise said. ‘Look at this.’

Now there was a *loop* of cosmic string, twisting in space and oscillating wildly.

‘String loops can form, when strings cross each other,’ Louise said. ‘But they’re unstable. When loops form they decay away rapidly . . . unless they are stabilized, as the Xeelee have made stable their nightfighter wings. Now: remember I told you that the strings are superconducting threads, carrying immense electrical currents? When the strings decay, all that electromagnetic energy has to go somewhere . . .’

Abruptly the loop shrank, precipitately, and once again light blasted into Spinner’s face.

Spinner lifted her hand to her faceplate. ‘I wish you’d stop doing that,’ she said.

‘Sorry. But *watch*, Spinner. See what’s happened?’

Spinner dropped her hand and blinked dazzled eyes.

The explosion of the loop of string had blown out a huge hole, in the middle of the mesh of galaxy threads.

Spinner nodded. ‘I get it. There’s a pulse of electromagnetic energy, which blows a bubble in the clouds of matter.’

‘Not quite,’ Louise said. ‘Spinner, remember that dark matter is *transparent* to photons - to electromagnetic radiation. So the loop’s electromagnetic pulse blows out just the *baryonic* matter; it leaves a hole, filled by dark matter but scoured clean of star stuff.

‘Spinner, all this cosmic engineering induced by the strings - the primordial seeds - has left us with a *fractal* structure. *Fractal* means the foam has the same general structure at all scales. It *looks* the same, no matter how far out or how close in you study. Our Galaxy is part of a small cluster - the Local Group - which, together with several other clusters, is part of a supercluster called the Virgo Cluster . . . which in turn—’

‘I get the idea,’ Spinner said.

‘The baryonic matter is clustered in filaments and sheets, around huge voids filled only with dark matter. It’s like a froth, Spinner - and it’s a very active froth, like an ocean’s surface, perhaps; the strings are whipping through space at near lightspeed, and so there are huge movements, currents in the foam.’

‘Louise, you said you’d show me where *I* am.’

‘All right, Spinner . . .’

Below the glistening glass the curves of the nightfighter rippled like some immense sculpture. There was Xeelee construction material only feet away from her now, and Lieserl had an urge to reach out and stroke it, as if the ‘fighter were some immense, caged animal. But the material was separated from her both by the base of the lifedome and by a layer of hard vacuum - and, she thought ruefully, by a layer of unreality which only Mark Wu and his gadgets could breach.

‘You’re thoughtful,’ Milpitas said.

She rubbed her chin. ‘I was thinking how very *alive* this Xeelee ship looks. Not like a piece of technology at all. This is like some immense ocean beast, trapped beneath a frozen surface; it’s as if I can see *muscles* beneath that skin of construction material.’

Milpitas grunted. ‘It’s an attractive image,’ he said dryly. ‘Although I’m not entirely sure how helpful it is.’

Lieserl glanced up at the maintenance layer, a fifth of a mile above her, with its tangle of tree roots and plumbing conduits. ‘Look at that primitive mess up there, by contrast . . . Lethe’s waters, Milpitas, this was a starship designed to last a thousand years. Some of that design looks as if it predates the Romans.’ She sighed. ‘You know, I caught a few glimpses of human technology, as we advanced over the years after the *Northern*’s launch. Obviously, we got better with time. But we always - *always* - ended up carrying our damn plumbing with us. I don’t think humans ever, in their long history, *ever* came close to matching the simple perfection of this one Xeelee artifact, this nightfighter.’

Milpitas dipped closer to the transparent base surface and peered through it, intent. ‘Perhaps you are right. But does that imply we should bow down and worship the Xeelee and all their works?’

‘No,’ she said coldly. ‘But it *does* imply that the Xeelee were smarter than we ever were, or could have become.’

She saw his eyebrows rise, through a fraction of an inch; otherwise he didn’t reply.

Now they were close to the rim of the base, near the transparent, curving wall of the loading bay. Here, the broad shoulders of the ’fighter nestled against the underside of the base; thick bands curled from the base around the ‘fighter’s curves and out of sight, hugging the ‘fighter against the lifedome.

Milpitas leaned over the control bar of his scooter, peering at the attaching bands. He seemed quite fearless, Lieserl thought with some amusement, now that he was only a few feet above the lifedome base: close to the floor of his rigid, gravity-dominated mental universe.

She allowed herself to sail smoothly along the lines of the Xeelee ship. *Shoulders* - yes, that was a good label for this part of the 'fighter, at the root of the wings; here, so close to the ship, she had a real sense of being *carried*, on the broad, strong shoulders of some giant of construction material.

Milpitas straightened up from his inspection.

'So how's the engineering?' she asked.

'Fine,' he said, without looking up. 'That is, within tolerance limits . . . The creep is minimal today.'

'*Creep*?'

He studied her. 'Perhaps you're not aware of the problems we faced, fixing the lifedome to this nightfighter. Lieserl, Xeelee construction material is effectively frictionless, and it is harder than any material substance known to us. It's impervious even to exotic matter . . . You know we've speculated its manufacture may have violated the Pauli Exclusion Principle—'

'I heard about that.'

'So when we came to attach the lifedome, we couldn't simply *nail* a superstructure to the nightfighter. No known adhesive would adhere to the construction material either. So, instead, we constructed a loose cage around the 'fighter.'

Governed by the *Northern*'s processors, 'bots had drawn in the straps comprising the cage, slowly and steadily tugging the lifedome against the nightfighter.

'So,' the Planner said, 'the strap arrangement hugs the nightfighter tightly against us, without *fixing* us to it. But that's obviously enough to persuade the 'fighter to carry the lifedome safely through hyperspace.'

'And - creep?'

'Because the cage is not fixed to the 'fighter - and because we are subject to various stresses - the cage's bands slip over the construction-material surface. They creep. But we have nanobots out there working continually, readjusting the straps and compensating for stress.'

Lieserl nodded. ‘It’s a smart solution, Milpitas.’

He bowed, sardonically. ‘Perhaps. But I can’t take the credit for it. I merely implemented the design which—’

Suddenly she felt a stab of pity for this scarred, *stunted* man. ‘Don’t underestimate yourself,’ she said on impulse. ‘Believe me, you’ve achieved so much . . .’

‘For a madman?’ he asked disarmingly. He smiled at her. ‘I know you think I’m a rather foolish, rigid person, Lieserl.’

Startled, she opened her mouth to deny this, but he held up his hand.

‘Well, perhaps I am. But I *was* responsible, in large part, for the teams of ‘bots which constructed this frame for the nightfighter. I know that our sensors could tell us much more about the state of the infrastructure which fixes us to this nightfighter than my naked gaze ever could. And yet—’

‘And yet, you feel you want to see it for yourself?’ She smiled. ‘You’re wrong, Planner. You’re not the easiest person I’ve ever had to get along with, but I don’t think you’re a fool to follow your instincts.’

He studied her, coolly appraising. ‘You believe so?’

‘I know so,’ she said firmly. ‘After all, that was the whole point of my stay in the Sun - in fact, the point of my very *existence*. Plenty of probes were dropped into the Sun ahead of me, and after me. I was sent in so that - at least through a surrogate - human eyes could *see* what was happening in there.’

He grunted. ‘Although, it seems, we made precious little use of the insights you gained.’

‘That’s as may be.’ She laughed. ‘But I couldn’t control that.’

He studied her. ‘You may be a surrogate,’ he said. ‘But, Lieserl, despite that, your humanity is powerful and obvious.’

That left her confused. She kept her face straight, determinedly. She issued subvocal commands, overriding the autonomic simulation of her face; she was adamant that her cheeks shouldn’t show a hint of colouring. ‘Thank you,’ she said lightly. ‘Although I’m not sure you *need* thanks. You’re not proffering compliments, are you? I suspect you don’t praise, Planner; you *ap*praise,’ she said.

‘Perhaps.’ He turned away, closing the subject.

She studied his battered profile. Milpitas gave the impression of a man in control, but maybe he gave away more than he bargained for. With

Milpitas, the communication of information was only one function - and a subsidiary one at that - of speech. The real purpose of conversation, for Milpitas, was *control*. She felt he was constantly fencing with her - testing her sharpness, and strength of will.

This was a man who was used to power, and used to exerting it, even in the most trivial conversation. But what type of person was this who - after centuries of subjective existence - would bother to fence with a tired old Virtual like her?

Milpitas continued his inspection, slowly, methodically.

Perhaps he was a little less than human - less, even, than *her*, she thought. Still - she conceded warily - there was a core of strength in Milpitas she had to admire.

Milpitas had been forced to watch his world - a world he'd *controlled* - fall apart, before his eyes. And he'd fought hard to preserve it. But then he'd *stopped* fighting, when he realized his old world was gone - that his beliefs were actually indefensible.

And *that* was the hard part. *That*, she reflected, was the point from which the endless strings of martyrs strewn across mankind's bloody history had failed to return. And since then he'd kept functioning - contributing to the mission.

She grinned. 'I think you're tougher than you look, Planner Milpitas. I mean, you have managed to break out of the prison of your past . . .'

He turned. 'But the past is *not* a prison,' he said softly. 'The past is altered, constantly, by our actions in the present. Every new act revalues the meaning of the past . . .'

She was surprised. 'That sounds like the surface of a deep philosophy.'

'Deep, and old,' he said. He eyed her, the tracery of scars over his scalp vivid in the flat light of the loading bay. 'We in Paradoxa were never one-dimensional oppressors, Lieserl. We saw ourselves as preserving the best of humanity's wisdom, and we sought constantly to interpret our present and future in history's light . . .'

She grunted. 'Hmm. Interesting. Perhaps the notion of a fluid past, recast in the light of our changing assumptions, is the only philosophy which will allow a race of immortals to stay sane. Maybe I'm still underestimating you, Milpitas.'

He touched his control bar and, gently, rose into the air. His face was impassive. ‘Perish the thought,’ he said dryly.

The Universe-image expanded, focusing on a comparatively small volume; Spinner studied a nondescript chunk of cosmic foam, a collection of threads, voids and sheets of shining matter.

‘Okay, Spinner-of-Rope: here’s a three-dimensional map of our neighbourhood. The voids are around a hundred million light-years across, on average.

‘Now here’s a local landmark - a famous void called the Hole in Boötes, two hundred million light-years across - and, look, here’s the *Great Wall:* the largest coherent structure in the Universe, a sheet of galaxies *five hundred million* light-years long.’ Louise paused, and when she spoke again her voice was darker, tinged with the resentment and half-suppressed anger Spinner had come to recognize. ‘Of course the Wall isn’t quite the tourist site it was when I was a girl,’ she said sourly. ‘The damn photino birds have been active there as well . . . All across the Wall, as far as we can observe, there’s evidence of bird degradation.’

Spinner allowed herself to smile. She could imagine what Louise was thinking. *Damn it, it’s our Wall!*

Louise was saying, ‘This cloud’ - a mist fragment the size of Spinner’s hand, labelled by a small red arrow - ‘is the Virgo Cluster. Our local supercluster.’ A small region within the Virgo cloud began to flash yellow, and a straight blue line snaked out of the yellow clump, piercing the heart of the Virgo. ‘The little yellow volume is the Local Group, where Sol is,’ Louise said, ‘and the line represents our journey so far with the nightfighter: right through the middle of the Virgo super-cluster.’

Spinner grunted. ‘Not very far.’

‘Oh, come on, Spinner; think about the scale of this picture!

‘Now look at this,’ Louise said. Small, lime-green vector arrows appeared, bristling over the dusty surface of the Virgo Cluster. ‘See that? The whole of our supercluster is moving through space - and it’s at a significant speed, a million miles an hour or more. So fast that the motion was even observable from Earth - it imposed a Doppler shift on the whole Universe, Spinner: on the microwave background radiation itself.’

Now more velocity arrows appeared on another massive cluster close to the Virgo Cluster. ‘There’s another supercluster, called Hydra-Centaurus,’

Louise said. ‘And guess what: *that’s* streaming in the same direction as the Virgo.’

Velocity arrows bristled now all over the foamy region of space . . . and all the arrows, Spinner saw, pointed *inwards*, to an anonymous region at the heart of the three-dimensional diagram.

And the projected blue line of the nightfighter’s voyage reached towards the centre of the immense implosion.

‘I know what that is,’ Spinner breathed. ‘At the centre of the implosion. That’s the Great Attractor.’ *The place all the galaxies are falling to . . .*

‘Yes. There seems to be a mass concentration there, attracting galaxies across hundreds of millions of light-years. The Attractor is a hundred and fifty million light-years from Sol, and with the mass of ten thousand galaxies . . .’

Staring into the toy Universe, Spinner-of-Rope felt her heart flutter. ‘And if it really is an artifact—’

‘If it is, then it’s an artifact so massive it’s drawing in superclusters like moths, Spinner; so massive it’s actually counteracting the expansion of the Universe, in this part of space . . . It’s an artifact beyond our imagination.’

Yes, thought Spinner. *Beyond imagination. And that’s where we’re heading . . .*

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25

‘**I** don’t know why you had to drag me up here, into the forest,’ Louise grumbled. ‘Not *now*. Couldn’t you wait until you were sure of your data?’

Mark said, ‘But the data—’

‘Is partial, and incomplete, and hardly conclusive. What have you got - just two double images?’

‘But the spectral match of the double galaxy images is almost perfect, in each case. I tell you it *must* be string,’ Mark insisted.

‘And I’m telling you that’s impossible,’ Louise growled. She felt her irritation rise. ‘How could there be cosmic string in the middle of a void like this?’

Uvarov raised his skull-like face and cackled, relishing the conflict.

The three of them were suspended just below the forest skydome. Louise was on a zero-gee scooter, and Uvarov had been strapped into a stripped-down life support chair attached to three of the flexible little scooters.

Mark, irritatingly, was choosing to manifest himself as a disembodied head, twice life-size, hovering in the air. ‘How’s Spinner-of-Rope?’ he asked Louise.

She grunted. ‘Bearing up. We’re thirty-three days into the mission, now - thirty-three days for Spinner in that couch. And the last ten of them inside this damn hole in the sky.’

‘Well, this is really a pretty exciting part of the journey,’ Mark said. ‘We’re crossing the edge of the greatest cosmological void ever detected: more than two hundred million light-years across. As far as we can tell, we’re the only scrap of baryonic matter in all that immensity. That’s an exciting thought even without my evidence of cosmic string . . .’

‘Not exciting for Spinner,’ Louise said dryly. ‘For her this void is nothing but sensory deprivation.’

‘Hmm,’ said Uvarov. ‘*The Universe as an immense sensory deprivation tank* . . . maybe that’s a good image to sum up the photino birds’ cosmic handiwork.’

Now schematic graphics of remote galaxies - sheets of them, at the boundary of the huge void - peppered the dome with splashes of false

colour; here and there fragments of text and supplementary images were interspersed amid the insect-like galactic swarms.

Mark's head swivelled around towards Louise. 'Look, I'm sorry you don't think it's appropriate for me to have dragged you up here. Maybe I *should* have waited for *proof* of the string's existence. Well, I didn't realize we were out here to do *science*. I thought we were trying to find ways to stay alive - to anticipate what we're up against. And that means reacting - *and thinking*, Louise - as quickly and as flexibly as possible. All right, maybe I'm guessing. But - what if it *is* cosmic string out there? Have you thought about that?'

Louise turned her face, uncertainly, up to the dome. 'If it is string - *here* - then, perhaps, we're heading into something even more extraordinary than we've anticipated.'

Uvarov chuckled. 'Perhaps we should stick to the *facts*, my dear Mark.'

'There are *no* facts,' Louise said. 'Only a handful of observations. And - across distances measured in hundreds of millions of light-years, and taken from a platform moving through a hyperdrive journey - they're damned imprecise observations at that.'

Uvarov turned his head to the Virtual. 'Tell me about your observations, then. Why are these double images so all-fired important?'

'I've been taking observations of the far side of the void' the Virtual said. 'I've been looking for evidence of gravitational lensing . . . The distortion of light from distant objects by the gravitational field of some huge, interposed mass. I wasn't looking for *strings* specifically. I was trying to see if I could detect any structure within the void - any concentrations of density.'

'Are the strings so massive, then, that they can distort light so far?'

Louise said, 'It isn't really as simple as that, Uvarov. Yes, strings are massive: their width is only the Planck length, but their density is enormous - a one-inch length would have a mass of around ten million *billion* tons . . . a string stretching from Sol to Saturn, say, would have around one Solar mass. We expect strings to be found either in loops thousands of light-years across, or else they will be *endless* - stretched right across the Universe by the expansion from the singularity.'

Uvarov nodded. 'Therefore, if they are so massive, their gravitational fields are correspondingly huge.'

‘Not quite,’ Louise said. ‘Strings are very exotic objects. They aren’t like stars, or planets, or even galaxies. They simply aren’t Newtonian objects, Uvarov. The relativistic gravitational fields around them are *different*.’

Uvarov turned to her. ‘Are you telling me the strings are antigravitational, like the domain walls of the nightfighter’s discontinuity-drive wings?’

‘No . . .’

Far enough from a loop - a finite length of string - the mass of the string would attract other bodies, just as would any other massive object. But an observer *close* to a string, either a loop or part of an infinite string, would *not* experience the gravitational effects to be expected from such massive concentrations of matter.

Louise said, ‘Uvarov, gravitational attraction works by distorting spacetime. Spacetime is flat if no heavy objects are present; an object will sail across it in a straight line, like a marble across a tabletop. But the spacetime close to a Newtonian object, like a star, is distorted into a well, into which other objects fall. But close to a string, spacetime is locally *flat* - it’s what’s called a Minkowski spacetime. Objects close by *aren’t* attracted to the string, despite the huge mass . . .’

‘But,’ Mark said, ‘the spacetime around a string *is* distorted. It is *conical*.’

Uvarov frowned. ‘Conical?’

‘Imagine spacetime as a flat sheet. The presence of the string removes a slice from that sheet - like a slice of a pie, cut out of spacetime. What’s left of the spacetime is joined up - the hole left by the missing slice is closed up - so that the spacetime is like a cone. Still flat, but with a missing piece.

‘If you were to draw a circle around a string, you would find its circumference shorter than you would expect from its radius - it’s just like drawing a circle around the apex of a cone.’

‘And this small spacetime defect is sufficient to cause the double images you speak of?’

‘Yes,’ Mark said.

A cosmic string wasn’t visible directly. But its path *could* be made visible, by a track of double images of remote objects, separated by about six arc seconds, along the length of the string.

Louise said, ‘Uvarov, imagine two photons setting off towards us from a remote galaxy, beyond a string. One of them comes to us directly. The second, passing on the far side of the string, travels through the conical defect. The second photon actually has less distance to travel to reach us, thanks to the defect; its journey time is less than the first’s by around ten thousand years. Hence, the double images.’

Uvarov grunted. ‘Louise, you have explained to me how the network of strings was the web around which the galaxies coalesced. I do not understand how this can be, if the gravitational effects of these strings are so slight.’

Louise sighed. ‘The strings are primeval objects: they were formed within an invisible fraction of a second after the Big Bang itself, during the symmetry loss caused by the decomposition of the unified superforce. Since then, the expansion of the Universe has *stretched* the strings. So the strings are under great tension - a tension caused by the expansion of the Universe itself . . . The strings whip through space, at close to the speed of light.

‘Where the strings pass, their conical defects cause them to leave a *wake*. Matter falls in towards the two-dimensional, sheet-like path swept out by the string. And it’s this infalling that caused the formation of the baryonic matter structures we observe now: clusters of galaxies, in threads and sheets.’

‘In fact,’ Mark said, ‘the wake is itself observable. Or should be. It imposes a slight Doppler shift on the microwave background radiation. I should be able to see a slightly brighter sky on one side of the invisible string than on the other . . .’

‘And have you seen this?’ Uvarov snapped.

‘No,’ Mark admitted. ‘Damn it. The *Northern* couldn’t be a much worse platform for this kind of measurement; the microwave Doppler is below my level of resolution.’

‘But you do think you’ve found some image pairs,’ Uvarov persisted.

‘Yes,’ Mark said, sounding excited again. ‘Two pairs so far, and a few other candidates. The two pairs are aligned, just as you’d expect them to be if a string is the cause . . .’

‘Enough,’ Uvarov snapped. He raised his chair into the air above them and prowled across the underside of the skydome, his ravaged profile silhouetted against the false colours of the galaxies. ‘Now tell me what this

means. Let us accept, Louise, that your Virtual lover has found a fragment of this - *string*. So what? Why should we care?'

'We're in a *void*, Uvarov,' Louise said patiently. 'We'd expect to find string at the heart of huge baryonic structures - like the Great Wall, for instance, a sheet of clusters half a billion light-years long, which—'

'But we are *not* at the heart of such a huge baryonic structure. Is that your point, Louise?'

'Yes. That's the point. There's no reason why we should find string *here*, in this void, away from any concentrations of matter.'

'I see. There is nothing out there but dark matter,' Uvarov growled quietly. 'Nothing but the photino birds, and their even more exotic cousins - and whatever they've chosen to build, here at the heart of their dark empire, far from any baryonic structure.'

Uvarov wheeled to face Louise, his scooters spurting puffs of reaction gas. 'If it exists, will the string have any effect on the photino birds?'

'Possibly,' Mark said. 'Strings are gravitational defects. Dark matter is influenced by gravity . . .'

Uvarov nodded. 'So perhaps the string is here to do damage to the photino birds. Is that possible? Perhaps the string has been moved here *deliberately*.'

'I hadn't thought of that, but I guess it's possible.' Mark peered up into the dome, his eerie, disembodied head looking bizarre. 'Yes. If someone is waging war on the photino birds, then maybe they are using lengths of cosmic string as weapons. Think of that. And more: who in this Universe is capable of such an act, but the Xeelee themselves?

'Lethe - fighting wars with bits of cosmic string. How have they the audacity to even *imagine* such weapons?'

Louise looked up into the dome's sketchy, gaudy rendering of the Universe. Suddenly these scraps of data seemed pathetic, their understanding hopelessly limited. Were the final wars for the destiny of the Universe being played out between Xeelee and photino birds, somewhere in this huge void, even now, as she stared up in her blindness and ignorance?

'Keep gathering your data, Mark,' she said. 'In another few days we'll be out of this damn void.'

'We're like rats, crossing the rim of some huge war zone,' Mark said, his huge face expressionless. 'We can barely comprehend the visions

around us. And we're heading for the final battlefield . . .'

Suspended between Decks, in the middle of a cloud of floating chickens, Mark and Lieserl made love.

Afterwards, Lieserl rested her head against Mark's bare chest. His skin, under her cheek, was rough, covered in short, tight-curled dark hairs, and slick with sweat - in fact she could taste the sweat, smell its salty tang. She felt a pleasant, moist ache in her thighs.

'I still feel breathless. Maybe I'm too old for this,' she said.

Mark nuzzled her hair. 'Then make yourself younger.'

'No.' She pressed her face against his chest. 'No, I don't want to change anything. Let's keep it just the same, Mark; let's keep it *real*.'

'Sure.'

She was silent for a moment. Then, despite herself, she added, 'And it is bloody real, you know. A magnificent illusion.'

She felt him smile.

'I told you. I've put a lot of time into getting it right,' he said. 'This and coffee.'

She laughed, and pulled herself away; her skin parted from his with a soft, moist sucking sound. 'I wonder if anyone was watching us.'

Mark stretched; the chickens, fluttering and clucking, swam clumsily through the air away from his arms. He glanced around. 'I don't see anyone. If there was, do you care?'

'Of course not. It might have done them good, in fact. Shaken them up a bit more.'

Lieserl rolled in the air, reached behind her back and began to straighten her hair. The Decks wheeled slowly around her, an immense box of green-furred walls. After the surrender of the Temples, the coming of zero-gee had, slowly, made inroads into the life of the people - the Undermen, as Spinner-of-Rope still called them - who lived here between the Decks. The most noticeable was the cultivation of *all* of the available surfaces of the Decks; now, the walls and ceilings were coated with meadows, patches of forests, fields of wheat and other crops. The trees grew a little haphazardly, of course, but they were being trained to emerge straight. And, without the pressure of walking feet, the grass in the parks and other areas was beginning to look a little wild.

A huddle of people had gathered under what had been the roof of Deck Two - the underside of Deck One. Mark - or rather a second projection of him - was taking the hesitant, young-old people through a literacy and Virtual usage programme. And elsewhere, Lieserl knew, the infrastructure of the Decks was being upgraded to remove the Decks' enforced reliance on pictograms.

These initiatives gladdened Lieserl. She remembered the world of her brief childhood, drenched in Sunlight and data and Virtuals and sentience: perhaps the most information rich environment in human history. The contrast with the stunted, data-starved environment of the Decks was poignant.

In one spot, close to the surface, she saw Milpitas and Morrow, toiling together. The two old men were constructing a sphere of water, bound together in a frame of wood and reeds: *a zero-gee water garden*, Morrow had called it. Lieserl remembered his smile. 'All part of Milpitas' therapy,' he'd said.

The whole environment made for a charming prospect: the Decks had evolved away from the bleak, iron-walled prison they'd been under the Planners during the long flight, and turned into a green-lined sylvan fantasy. There were trees growing at you out of the sky, for Life's sake. And some inspired soul had liberated boxes of wild flower seeds from the *Northern*'s long-term stores; now the inverted meadows were, more often than not, peppered with bluebells.

The old floors were still coated with the old, boxy homes and factories, of course. But many of the homes had been abandoned; they sat squat on the surface like empty shells. Instead, new homes had been established in the air: rangy, open dwellings, loosely anchored to whichever surface was nearest, or fixed on thin, impossibly fragile spindles.

She held Mark's hand and drifted through the chicken cloud, drinking in the fowls' childhood, farmyard smell (. . . or at least a Virtual, cleaned-up version of it). 'You know,' she said, 'maybe zero-gee was the best thing that could have happened to this society. Slowly the Decks are turning into a decent place to live.'

Mark grunted. 'But it's taken a *long* time. And sometimes I think this is all a little unreal.'

'What is?'

He waved a hand. ‘The strange, aerial society that’s been established here. I mean, beyond these walls of grass there is *nothing* - nothing but an intergalactic desert, across which we’re fleeing in search of protection from an alien species with whom man has been at war for megayears . . .’

Across the Universe we flee, Lieserl thought, *with chicken eggs and bluebells . . .*

‘Maybe that’s true,’ she said. ‘But so what? Is it a bad thing? What can the people here do, but live their lives and maintain the lifedome’s infrastructure? An awareness of what’s outside - of the Universe as megayear celestial battlefield, across which we’re fleeing - is like a morbid, paralysing awareness of death, it seems to me. Mark, we’re bystanders in the middle of a war. I suspect the last thing any of us needs is a sense of perspective.’

He grinned, and laid his hands on her bare hips. His eyes were alive, vibrant blue, within his coffee-dark face. ‘You’re probably right.’ He pulled her to him, and she could feel the firmness of a new erection against her own pad of pubic hair. ‘What can any of us do, but follow our instincts?’

She felt a small, contained part of herself open up in his warmth. Sex - even this Virtual reconstruction of it - was *wonderful*, and, remotely, she was reminded once more of how much had been kept from her during her brief, engineered life. She’d gained five million years of sentience, but had been deprived of her ancient, human heritage.

She lifted her arms and wrapped them around Mark’s neck. ‘You should be careful with me,’ she said. ‘I’m an old lady, you know . . .’

He bent his head to hers and kissed her; she ran her tongue over the sharpness of his teeth.

Around them, the chickens rustled softly, detached feathers drifting through the air like snow.

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26

It was a *good* day for Spinner-of-Rope.

She found a large hive high in a tree. The bees buzzed in alarm as she approached, but she circled the trunk warily, keeping away from their vicious stings. She set a small fire in a notch in the bark a little below the fat, lumpy form of the hive, and piled the flames high with moist leaves; she let the thick smoke waft up and over the hive. The bees, disoriented and alarmed, came flooding out into the smoke and scattered harmlessly.

Spinner, whooping in triumph, clambered back to the abandoned hive, broke it open with her axe of Underman metal, and dug out huge handfuls of comb, dripping with thick honey. She feasted on the rich, golden stuff, cramming it into her mouth; the honey smeared over her face and splashed her round spectacles. There would be more than enough to fill the two leather sacks she carried at her waist.

. . . Then, sitting on her branch, eating the honey, she found herself shivering. She frowned. Why should she be *cold*? It wasn't even noon yet.

She dismissed the odd sensation.

In a nearby tree, a hundred yards from Spinner, a man sat. He wore a battered coverall, and his face looked tired, lined, under a thatch of grey hair. He was eating too: a fruit, a yam, perhaps. He smiled and waved at her.

He was a friend. She waved back.

She rinsed her face in a puddle of water inside a fat bromeliad, and climbed down to the ground.

She ran lightly across the level, leaf-coated floor of the forest. Arrow Maker would be tending his bamboo clumps, she knew; there were only a few groves of the species which provided the six-feet-long straight stems Arrow Maker needed to manufacture his blowpipes, and Maker cultivated the clumps with loving care, guarding them jealously from his rivals. Spinner would run up to him and show him the honey treat she'd found, and then—

Spinner-of-Rope. I know you're awake.

. . . and then . . .

Come on, Spinner, talk to me.

Spinner slowed to a halt.

With regret she glanced down once more at the honey she would not be able to enjoy, and issued a soft, subvocal command.

Out of the air, the environment suit congealed over her limbs like some web made of silvery cloth, and the bulky couch materialized around her body. Like a skull poking through decaying flesh, the darkness of space, the harsh telltale lights of her waldoes, emerged through the forest dream.

'Spinner-of-Rope. *Spinner*.'

Her heart beat as rapidly as a bird's. 'Yes, Louise.'

'I'm sorry I had to dig you out of your Virtual like that. You, ah, you didn't want to come back to us, I don't think.'

Spinner grunted as the suit went into its daily sonic bath routine. 'Well, can you blame me for wanting to escape?' She let the bleakness outside the cage flood into her mind. How *wonderful* it had been to be ten years old again, to have no greater horizon than a day's frog-hunting with her father! But she *wasn't* ten years old; more than five decades had worn away since those honey-hunting days, and since then immense responsibilities had descended on her. The renewed awareness of *who she was* settled over her like a tangible weight: a weight she'd been carrying around for all this time - but which she'd forgotten to notice.

She shivered again - and became suddenly, sharply suspicious. She hissed out brief subvocal commands and called up a display of her environment suit air temperature. It was around eighteen degrees Celsius. Not exactly ice-cold, but still noticeably cool. She called up a faceplate-graphic of how her suit temperature had varied over the last few days.

The coldness she'd felt in her dream had been real. The suit temperature had been *changed*. For more than a week it had been maintained at twenty-five degrees - fully seven degrees warmer than today.

'Louise,' she said sternly.

She heard Louise sigh. 'I'm here, Spinner-of-Rope.'

'What in Lethe is going on? What have you been trying to do, cook me to death?'

'No, Spinner. Look, we've come to understand - a bit belatedly, maybe - how hard this trip is for you. I wish, now, we'd found some other solution: someone else to relieve you, perhaps. But it's too late for that. We've got ourselves into a situation in which we're very dependent on you, and your continued good functioning out in that cage, Spinner.'

‘And the heat?’

‘Heat acts as a mild sedative, Spinner-of-Rope. As long as your fluid balance isn’t affected - and we’re monitoring that - it’s quite harmless. I thought it was a good solution to the problem . . .’

Spinner rubbed her cheek against the lining of her helmet. ‘Right. So you were sedating me, without my consent. Louise Ye Armonk, engineer of human bodies and souls . . .’

‘I guess I should have discussed it with you.’

‘Yes, I guess you should,’ Spinner said heavily. ‘And now?’

Louise hesitated. ‘It was becoming harder and harder to dig you out of your fantasies, Spinner. I was afraid we might lose you altogether . . . lose you to a dream of the forest.’

A dream of the forest.

With a sigh she straightened her posture in her couch. ‘Don’t worry, Louise. I won’t let you down.’

‘I know you won’t, Spinner.’ Louise sounded nervous, excited - uncharacteristically so. ‘Spinner-of-Rope . . . *it’s the fifty-first day*. Look around you.’

Spinner loosened her restraints; she glared around at her surroundings, at first seeing only emptiness. Irritated, she snapped out subvocals, and the faceplate began to enhance her naked-eye images.

‘Spinner, we’ve travelled a hundred and fifty million light-years. We’re reaching the end of the programmed hyperdrive jumps . . .

‘It’s nearly over, Spinner-of-Rope. We’re almost there.’

As the faceplate worked, dim forms emerged - the moth-like forms of galaxies, far away, all around her. She saw spirals, ellipticals, gigantic irregulars: huge clusters of galaxies in their characteristic threads and sheets, the whole vision looking impossibly fragile.

But there was something odd about the pale images.

‘We’ve arrived, Spinner-of-Rope,’ Louise said. ‘We are at the centre of things.’

Blue shift, Spinner-of-Rope. Blue shift, everywhere . . . Can you see it?

Yes. The galaxies - all around her sky - were tinged *blue*, she realized now. *Blue shift.*

She had come, at last, to the place all the galaxies were falling into.

PART V

EVENT: RING

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27

The nightfighter - with its fragile cargo of humans, and travelling thirty-five light-years with every hyperdrive jump - arced down towards the disc of the scarred galaxy. Spinner-of-Rope sat in her cage, letting the waldoes run through their program; in the corner of her eye, telltales winked reassuringly.

This galaxy was a broad spiral, with multiple arms tightly wrapped around a compact, glowing core. The star system was a pool of rust red, punctuated with the gleam of novae and supernovae: thus, she saw, the galaxy had not escaped depredation at the hands of the photino birds. And the gleaming disc was disfigured by one stunning feature: a huge gouge of a scar, a channel of dust and glowing star-stuff that cut right across the disc, from rim to core.

Now the nightfighter, flickering through hyperspace, neared the rim of the disc, close to the termination of the scar.

This might have been the original Galaxy of humans, Spinner thought, and she wondered if Louise Armonk was sitting under the skydome over the forest, peering out at this freight of stars. Maybe this nostalgic similarity was the reason Louise and the rest had chosen this particular galaxy, out of hundreds of thousands around the cavity, for a closer study.

Suddenly the plane of the disc loomed up at her - and the nightfighter slid neatly into the notch gouged out of the disc.

‘Good navigation, Louise,’ she said. ‘Right down the channel.’

‘Well, it wasn’t so hard to hit. The channel is over two thousand light-years wide, and as straight as one of your blowpipes. The channel was cut so recently that the galaxy’s rotation hasn’t had time to distort it too far - although, in another few hundred thousand years there will be barely a trace of this feature left . . .’

The ‘fighter plunged along the gouge, and the view was spectacular. Above her was the gaunt, galaxy-stained sky of the Attractor; below and around her was an open tunnel of stars, hurtling past her. Looking ahead, it seemed she could see all the way to the gleaming core of the galaxy. It was difficult to remember that this neat star-walled valley was no less than fifty thousand light-years long . . .

At thirty-five light-years a second, the ship would reach the core in under thirty minutes.

Now the ‘fighter dived into a bank of opaque dust - and then exploded out again, the stars gleaming crimson and gold in the walls of the galaxy-spanning tunnel.

Spinner punched her fist into her palm and whooped.

She heard Louise laugh. ‘You’re enjoying the ride, Spinner-of-Rope?’

There were voices behind Louise Armonk. ‘I see it.’ Excited, shouting. ‘I see it—’

I see it, too.

Spinner turned in her chair, the restraints riding up awkwardly across her chest. The voice had sounded as if it had come from her left.

It had been the voice of the man from her forest dreams, of course. She almost *expected* to see that slim, dark form, sitting out there beyond the cage: that sixty-year-old face, the hair of grey pepper-speckled with black, the vulnerable brown eyes . . .

Somehow, she felt he was coming closer to her. He was *emerging.*

But there was nobody there. She felt disappointed, wistful.

‘That was Morrow, butting in,’ Louise was saying. ‘I’m sorry, Spinner. Do you want me to patch you into the conversation? . . . Spinner? Did you hear me? I said—’

‘I heard you, Louise,’ she said. ‘I’m sorry. Yes, patch me in, please.’

‘ . . . straight ahead of us, at the end of this gouge,’ Morrow was saying. ‘There . . . *there* . . . See?’

‘Spinner, I’ll download our visuals to you,’ Louise said.

Spinner’s faceplate image was abruptly overlaid with false colours: gaudy reds, yellows and blues, making detail easy to discriminate.

The glowing walls of the star valley dwindled into a dull mist at infinity. And at the end of the valley - almost at the vanishing point itself - there was a structure: a sculpture of thread, coloured false blue.

‘I see it,’ Spinner breathed. Subvocally, she called for magnification.

‘Do you know what you’re looking at, Spinner?’ Louise’s flat voice contained awe, humility. ‘It’s what we suspected must have gouged out this valley. It’s a fragment of cosmic string . . .’

At the centre of an immense cavity, walled by crowded galaxies, Lieserl and Mark rotated slowly around each other, warm human planets.

The sky was peppered with the dusty spirals of galaxies, more densely than the stars in the skies of ancient Earth. But the cavity walls were ragged and ill-defined, so that it was as if Lieserl was at the centre of some immense explosion. And every one of the galaxies was tinged by *blue shift*: the light from each of these huge, fragile star-freights was compressed, visibly, by its billion-year fall into this place.

Mark took her hand. His palm was warm against hers, and when he pulled gently at her arm, her body slowly rotated in space until she faced him.

'I don't understand,' Lieserl said. 'This - cavity - is empty. *Where's the Ring*?'

The light of a hundred thousand galaxies, blue-shifted, washed over his face. Mark smiled. 'Have patience, Lieserl. Get your bearings first.

'Look around. We've arrived at a cavity, almost free of galaxies, ten million light-years across: a cavity right at the site of the Great Attractor. The whole cavity is awash with gravitational radiation. Nothing's visible, but we know there's something here, in the cavity . . . It just isn't what we expected.'

Lieserl raised her face to stare around the crowded sky, at the galaxies embedded in the walls of this immense cave of sky. One galaxy with an active nucleus - perhaps a Seyfert - emitted a long plume of gas from its core; the gas, glowing in the searchlight beam of ionizing radiation from the core, trailed behind the infalling galaxy like the tail of some immense comet. And *there* was a giant elliptical which looked as if it was close to disintegration, rendered unstable by the fall into the Attractor's monstrous gravity well; she could clearly see the elliptical's multiple nuclei, orbiting each other within a haze of at least a thousand billion stars.

Some of the galaxies were close enough for her to make out individual stars - great lacy streams of them, in disrupted spiral arms - and, in some places, supernovae glared like diamonds against the paler tapestry of lesser stars. She picked out one barred-spiral with a fat, gleaming nucleus, which trailed its loosening arms like unravelling bandages. And there was a spiral - heart-breakingly like her own Galaxy - undergoing a slow, stately collision with a shallow elliptical; the galaxies' discs had cut across each other, and along the line where they merged exploding stars flared yellow-white, like a wound.

It was, she thought, as if the Universe had been wadded up, compressed into this deep, intense gravity pocket.

Everywhere she caught a sense of motion, of activity: but it was motion on an immense scale, and frozen in time. The galaxies were like huge ships of stars, Lieserl thought, voyaging in towards *here*, to the centre of everything - but they were ships caught suspended by the flashbulb awareness of her own humanity. She longed for the atemporal perspective of a god, so that she could run this immense, trapped diorama forward in time.

'It's all very beautiful,' she said. 'But it almost looks artificial - like a planetarium display.'

Mark grunted. 'More like a display of trapped insects. Moths, maybe, drawn in to an invisible gravitational flame. We're still sifting through the data we're gathering,' he said softly. 'I wonder if any astronomers in human history have ever had such a rich sky to study . . . even if it does mark the end of time.

'But we've found one anomaly, Lieserl.'

'An anomaly? Where?'

He raised his arm and pointed, towards an anonymous-looking patch of sky across the cavity. 'Over there. A source in the hydrogen radio band. As far as we can tell it's coming from a neutron star system - but the neutron star is moving with an immense velocity, not far below lightspeed. Anomalies all round, right? The source is difficult to pick out against all this galactic mush in the foreground. But it's undoubtedly there . . .'

'What's so special about it?'

He hesitated. 'Lieserl, it seems to be a signal.'

'A *signal*? From who?'

'How should I know?'

'Maybe it's a freak; an artifact of our instruments.'

'Quite possibly. But we're thinking of checking it out anyway. It's only a million light-years away.' He smiled ruefully. That's all of eight hours' travel, if you hitch a ride on a nightfighter . . .'

A signal, here at the end of space and time . . . Was it possible the motley crew of the *Northern* wasn't alone after all?

The hair at the base of her skull prickled. At the end of this long, long life, she'd thought there was nothing left to surprise her.

Evidently, she was wrong.

Mark said, ‘Lieserl, what you’re looking at here is visible light: the Virtual display we’re drifting around inside is based on images from right at the centre of the human visible spectrum. You’re seeing just what any of the others would see, with their unaided vision. But the image has been enhanced by blue shift: red, dim stars have been made to look blue and bright.’

‘I understand.’

Now the blue stain faded from the galaxy images, seeping out like some poor dye.

A new colour flooded the galaxy remnants, but it was the colour of decay - dominated by flaring reds and crimsons, though punctuated in places by the glaring blue-white of supernovae. And without the enhancement offered by the blue shift, some of the galaxies faded from her view altogether.

The galaxies had turned into ships of fire, she thought.

Mark’s profile was picked out, now, in colours of blood. ‘Take a good look around, Lieserl,’ he said grimly. ‘I’ve adjusted out the blue shift; this is how things *really* are.’

She looked at him curiously; his tone had become hostile, suddenly. Though he still held her hand, his fingers felt stiff around hers, like a cage. ‘What are you saying?’

‘Here’s the result of the handiwork of your photino bird pets,’ he said. ‘In the week since we arrived, we’ve been able to catalogue over a *million* galaxies, surrounding this cavity. In every one of those million we see stars being pushed off the Main Sequence, either explosively as a nova or supernova or via expansion into the red-giant cycle. Everywhere the stars are close to the end of their lifecycles - and, what’s worse, there’s no sign of new star formation, anywhere.’

Suddenly she understood. ‘Ah. *This* is why you’ve set up this display for me. You’re *testing* me, aren’t you?’ She felt anger build, deep in her belly. ‘You want to know how all this makes me *feel*. Even now - even after we’ve been so close - you’re still not sure if I’m fully *human*.’

He grinned, his red-lit teeth like drops of blood in his mouth. ‘You have to admit you’ve had a pretty unusual life history, Lieserl. I’m not sure if any of us can empathize with you.’

‘Then,’ she snapped, ‘maybe you should damn well try. Maybe that’s been the trouble with most of human history. Look at all this: we’re witnessing, here, the death of *galaxies*. And you’re wondering how it makes *me* feel? Do you think all this has somehow been set up as a test of my *loyalty* to the human race?’

‘Lieserl—’

‘I’ll *tell* you how I feel. I feel we need a sense of perspective here, Mark. So what if this - this cosmic discontinuity - is *inconvenient* for the likes of you and me?’ She withdrew from him and straightened her back. ‘Mark, this is the greatest feat of cosmic engineering our poor Universe will ever see - the most significant event since the Big Bang. Maybe it’s time we humans abandoned our species-specific chauvinism - our petty outrage that the Universe has unfolded in a way that doesn’t suit us.’

He was smiling at her. ‘Quite a speech.’

She punched him, reasonably gently, beneath the ribs, relishing the way her fist sank into his flesh. ‘Well, you deserve it, damn it.’

‘I didn’t mean to imply—’

‘Yes, you did,’ she said sharply. ‘Well, I’m sorry if I’ve failed your test, Mark. Look, you and I - by hook or by crook - have survived the decline and destruction of our species. I know we’re going to have to fight for survival, and I’ll be fighting right alongside you, as best I can. But that doesn’t remove the *magnificence* of this cosmic engineering - any more than an ant-hill’s destruction to make way for the building of a cathedral would despoil the grandeur of the result.’

Still holding her hand within his stiff fingers, he turned his face to the galaxy-stained sky. His offence at her words was tangible; he must be devoting a great deal of processing power to this sullen rebuke. ‘Sometimes you’re damn cold, Lieserl.’

Lethe, she thought. *People*. ‘No,’ she said. ‘I just have a longer perspective than you.’ She sighed. ‘Oh, come on, Mark. Show me the Ring,’ she said.

The sculpture of string, driving itself into the heart of the scarred galaxy, was not symmetrical. It was in the form of a rough figure-of-eight; but each lobe of the figure was overlaid with more complex waveforms - a series of ripples, culminating in sharp, pointed cusps.

‘Do you see it, Spinner?’ Mark asked. ‘That is a loop of string nearly a thousand light-years wide.’

Spinner smiled. ‘That’s not a loop. That’s a *knot*.’

‘It’s moving towards the galactic core at over half the speed of light. It’s got the mass of a hundred billion stars . . . Can you believe that? It’s as massive as a medium-size galaxy itself. No wonder it’s cutting this swathe through the stars; the damn thing’s like a scythe, driving across the face of this galaxy.’

Louise laughed. ‘*A knot*. Knot-making is a skill, up there in the forest, isn’t it, Spinner? I’ll bet you’d have been proud to come up with a structure like that.’

‘Actually,’ Mark said, ‘and I hate to be pedantic, but that *isn’t* a knot, topologically speaking. If you could somehow stretch it out - straighten up the cusps and curves - you’d find it would deform into a simple loop. A circle.’

Spinner heard Garry Uvarov’s rasp. ‘And I hate to be a pedant, in my turn, but in fact a simple closed loop *is* a knot - called the trivial knot by topologists.’

‘Thank you, Doctor,’ Louise said dryly.

Spinner frowned, peering at the detailed image of the string loop; in the false colours of her faceplate it was a tracery of blue, frozen against the remote background of the galaxy core. She realized now that she was looking at one projection of a complex three-dimensional object. Subvocally she called for a depth enhancement and change in perspective.

The loop seemed to loom towards her, lifting away from the starry background, and the string was thickened into a three-dimensional tubing, so that she could see shadows where one strand overlaid another.

The image rotated. It was like a sculpture of hosepipe, rolling over on itself. Mark commented, ‘But the string isn’t stationary, of course. I mean, the whole loop is cutting through this galaxy at more than half lightspeed - but in addition the structure is in constant, complex motion. Cosmic string is under enormous tension - a tension that increases with curvature - and so those loops and cusps you see are struggling to straighten themselves out, all the time. Most of the length of the string is moving at close to lightspeed - indeed, the cusps are moving at lightspeed.’

‘Absurd,’ Spinner heard Uvarov growl. ‘Nothing material can reach lightspeed. ’

‘True,’ Mark said patiently, but cosmic string isn’t truly *material*, in that sense, Uvarov. Remember, it’s a defect in spacetime . . . a flaw.’

Spinner watched the beautiful, sparkling construct turn over and over. It was like some intricate piece of jewellery, a filigree of glass, perhaps. How could something as complex, as *real* as this, be made of nothing but spacetime?

‘I can’t see it move,’ she said slowly.

‘What was that, Spinner?’

‘Mark, if the string is moving at close to lightspeed - how come I can’t *see* it? The thing should be writhing like some immense snake . . .’

‘You’re forgetting the scale, Spinner-of-Rope,’ Mark said gently. ‘That loop is over a thousand light-years across. It would take a *millennium* for a strand of string to move across the diameter of the loop. Spinner, it is writhing through space, just as you say, but on timescales far beyond yours or mine . . .

‘But watch this.’

Suddenly the three-dimensional image of the string came to life. It twisted, its curves straightening or bunching into cusps, lengths of the string twisting over and around each other.

Mark said, ‘This is the true motion of the string, projected from the velocity distribution along its length. The motion is actually periodic . . . It resumes the same form every twenty thousand years or so. This graphic is running at billions of times true speed, of course - the twenty-millennia period is being covered in around five minutes.

‘But the graphic is enough to show you an important feature of this motion. It’s *non-intersecting* . . . The string is not cutting itself at any point in the periodic trajectory. If it did, it would bud off smaller sub-loops, which would oscillate and cut themselves up further, and so on . . . the string would rapidly decay, shrivelling through a thousand cuts, and leaking away its energy through gravitational radiation.’

Spinner wished, suddenly, that she wasn’t *human:* that she could watch the motion of this loop unfold, without having to rely on Mark’s gaudy projections. How wonderful it would be to be able to step out of time!

. . . *Close your eyes, Spinner.*

‘What?’

You can *step out of time, just as you desire. Close your eyes, and imagine you are a god.*

. . . And here, in her mind’s eye - so much more dramatic than any Virtual! - came the knot of string, sailing out of space. The knot wriggled like some huge worm, closed on itself as if swallowing its own tail.

The knot struck the rim of this defenceless galaxy and scythed towards the core, battering stars aside like blades of grass.

It was a disturbing, astonishing image. She snapped open her eyes, dispelling the vision; fear flooded her, prickling over her flesh.

She wasn’t normally quite so imaginative, she thought dryly. Maybe her *companion* had had something to do with that brief, vivid vision . . .

She returned her attention to the harmless-looking Virtual display. Now Mark showed Spinner the loop’s induced magnetic field, a yellow glow of energy which sleeved the fake blue of the string itself.

‘As it hauls through the galaxy’s magnetic field, that string is radiating a lot of electromagnetic energy,’ Mark said. ‘I see a *flood* of high-energy photons . . .’

Cosmic string wasn’t actually one-dimensional; it was a Planck length across, a fine tube containing charged particles: quarks, electrons and their antiparticles, gathered into super-heavy clusters. As a result, string acted as a superconducting wire.

The string knot was cutting through this galaxy’s magnetic field. As it did so immense electrical currents - of a hundred billion billion amps or more - were induced in the string. These currents generated strong magnetic fields around the string.

The string’s induced field was stronger than a neutron star’s, and dominated space for tens of light-years around the knot.

Mark said, ‘The string has a maximum current capacity. If it’s overloaded, the string starts to shed energy. It *glows* with gamma radiation: And the lost energy crystallizes into matter: ions and electrons, whispering into existence all along the length of the string.’ Spinner saw representations of particles - out of scale, of course - popping into existence around the string image. ‘So the string is glowing as brightly as a star.’

‘Yes,’ Louise put in. ‘But the distribution of the radiation is odd, Mark. Look at this. The radiation is beamed *forward* of the loop’s motion - parallel

to that forward spike of gravitational radiation.'

'Like a searchlight,' Morrow said.

Or a spear . . ..

She heard Morrow saying, 'Mark, what is *driving* the string? What is impelling it through space, and into this galaxy?'

'Gravitational radiation,' Mark said simply.

Louise said, 'Morrow, gravity waves are emitted whenever large masses are moved through space. Because the loop is asymmetrical it's pushing out its gravitational radiation in particular directions - in spikes, ahead of and behind it. It is pushing out momentum . . . It is a *gravitational rocket*, using its radiation to drive through space.'

Mark said, 'Of course the gravitational radiation is carrying away energy - the string is shrinking, slowly. In the end it will collapse to nothing.'

'But not fast enough to save this galaxy,' Uvarov growled.

'No,' Louise said. 'Before it has time to decay away, the string is going to reach the core - and devastate the galaxy.'

Close your eyes.

Spinner-of-Rope shivered. Once again the voice had come from her left - from somewhere outside her suit. She stared at the Virtual image in her faceplate, not daring to look around.

Close your eyes. Think about your vision again - of the string loop, cutting through the stars. It frightened you, didn't it? What did that image mean, Spinner-of-Rope? What was it telling you?

Suddenly she saw it.

'Mark,' she said. 'This is *not* just a gravitational rocket.'

'What?'

'Think about it. The string knot must be a *missile*.'

The galaxy images dimmed, leaving Mark and Lieserl suspended in a crimson-tinged darkness. Then, against that background, new forms began to appear: speckles of light, indistinct, making up the ghostly outline of a *torus*, its face tipped open towards her.

'Of course this is a false colour representation,' Mark said. 'The images have been reconstructed from gravity wave and gamma ray emissions . . .'

The torus as a whole reminded her, distantly, of Saturn's rings; it was a circle which spanned the galaxy-walled cavity.

At first she thought the component speckles were mere points of light: they were like stars, she thought, or diamonds scattered against the velvet backdrop of the faded galaxy light. But as she looked more closely she could see that some of the nearer objects were not simple points, but showed structure of some kind.

So these weren't stars, she thought, and nor was this some attenuated galaxy: there were only (she estimated quickly) a few thousand of the shining forms, as opposed to the billions of stars in a galaxy . . . And besides, this cavity-spanning torus was immense: she could see how the blood-dark corpses of galaxies sailed *through* its sparse structure.

She knew that the Galaxy of humans had been a disc of stars a hundred thousand light-years in diameter. This torus must be at least *a hundred times as broad* - more than ten million light-years across.

She turned to Mark; he studied her face, a certain kindness showing in his eyes now. 'I know how you're feeling. It's magnificent, isn't it?'

'It can't be the Ring,' she said slowly. 'Can it? As far as we know, Jim Bolder reported a solid object - a single, continuous artifact.'

'Look more closely, Lieserl. Cheat a little; enhance your vision. What do you see?'

She turned her head and issued brisk subvocals. A section of the torus exploded towards her; the fragments, rushing apart, gave her a brief, disorienting impression of sudden velocity.

Her view steadied. Now, it was as if she was within the torus itself, and the sparkling component objects were all around her.

The fragments weren't simple discs - or ellipses, or any of the shapes into which a star or galaxy might be distorted by the presence of others. She could see darkness *within the heart* of these objects.

The fragments were *knots.*

'Mark—'

'You're looking at loops of cosmic string,' he said calmly. 'This immense torus is made up of string knots, Lieserl - ten thousand of them, each a thousand light-years across.'

She was aware of her hand convulsing closed around his. 'I don't understand. This is - fantastic. *But it isn't the Ring Bolder described*.'

He looked distant, wistful. 'But it *must* be. We know we've come to the right place, Lieserl. This is undoubtedly the site of the Great Attractor: the

loops, together, have sufficient mass to cause the local streaming of galaxies.

‘And we know this assemblage must be artificial. Primeval string loops could have formed during the formation of the Universe, after the singularity. But there should have been no more than a million of them - *in the entire Universe*, Lieserl - spaced tens of millions of light-years apart. It simply isn’t possible for a collection of ten thousand of the damn things to have gathered spontaneously within a cavity a mere ten million light-years across . . .’

‘But,’ Lieserl said patiently, ‘but Bolder said the Ring was solid. If he was right—’

‘If he was right then the Ring has been destroyed, Lieserl. These loops are - rubble. We’re looking at the wreckage of the Ring. The photino birds have won.’ He turned to her, his face a sculpture, expressionless, obviously artificial. ‘We’re too late, Lieserl.’

She felt bewildered. ‘But if that’s true - where are we to go?’

Mark had no answer.

Louise said, ‘What are you talking about, Spinner?’

‘Can’t you see it?’ She closed her eyes and watched, once again, as the string loop punched through the fragile superstructure of the galaxy. ‘Mark - Louise - this string loop was *aimed*, quite precisely. It’s a weapon. It is blasting through this galaxy with its gravitational rockets, destroying all in its path with focused beams of electromagnetic and gravitational energy . . .’

Louise snapped, ‘Mark?’

Mark hesitated. ‘We can’t prove she’s right, Louise. But the chances of the loop hitting such a precise trajectory at random are tiny . . .’

‘It seems crazy,’ Morrow said. ‘Who would *dare* use a thousand-light-year loop of cosmic string as a weapon of war?’

Uvarov grunted. ‘Isn’t that obvious? The very entities we have come all this way to seek, from whom we hope to obtain shelter - *the Xeelee*, Morrow; the baryonic lords.’

‘But why?’ Mark asked. ‘Why destroy a galaxy like this?’

‘In defence,’ Uvarov snapped.

‘What?’

‘Isn’t that clear too? The Xeelee were masters of the manipulation of spacetime. Their weaponry consisted of these immense structures of spacetime flaws. And the flaws have been used against the weapons of their enemies - *like this galaxy* .’

There was silence for a moment. Then Morrow said, ‘Are you insane, Uvarov? You’re saying that this *galaxy* has been hurled like some rock - deliberately?’

‘Why not?’ Uvarov replied calmly. ‘The photino birds are creatures of dark matter - which attracts baryonic matter gravitationally. We can easily imagine some immense dark chariot hauling at this fragile galaxy, hurling it hard through space . . .

‘Think of it. The photino birds must have begun to engineer the deflection of this galaxy’s path many millions of years ago - perhaps they were intent on launching this huge missile at the Ring long before men walked on the Earth. And the Xeelee must have been preparing their counter, this loop of string, over almost as great a timescale.’

Now Spinner-of-Rope felt a bubble of laughter, wild, rise in her own throat. She had an absurd image of two giants, bestriding the curving Universe, hurling galaxies and string loops at each other like lumps of mud.

‘We are truly in the middle of a war zone,’ Uvarov said coldly. ‘This galaxy, with the bullet of cosmic string aimed so accurately at its heart, is merely one incident among ten million in a huge battlefield. To our fleeting perceptions the field is frozen in time - we buzz like flies around the bullet as it hurtles *into* the chest of its target - and yet the battle rages all around us.’

Don’t be afraid.

Spinner closed her eyes and thought of the forest dream man, smiling at her from his tree and eating his fruit . . .

I know who this is, she realized suddenly. *I’ve seen his face, in Louise’s old Virtuals . . .*

‘I know you,’ she told him.

Yes. Don’t be afraid, said Michael Poole.

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28

Louise Armonk asked Spinner to take the nightfighter to the source of Mark's anomalous hydrogen-band signal.

She showed Spinner some data on the signal. 'Here's a graphic of the main sequence, Spinner-of-Rope.' A barchart, in gaudy yellow and blue, marched across Spinner's faceplate. 'We're getting pretty excited about this. For one thing it's periodic - the same pattern recurs every two hours or so. So we're pretty sure it has to be artificial. And look at *this*,' Louise said. A sequence of thirty bars, buried among the rest, was now highlighted with electric blue. 'Can you see that?'

Spinner looked at the ascending sequence of bars, trying hard to share Louise's excitement. 'What am I looking for, Louise?'

She heard Louise growl with impatience. 'Spinner, the amplitude of these pulses is increasing, *in proportion with the first thirty prime numbers*.'

The electric-blue bars were split into discrete blocks, now, to help Spinner see the pattern. She counted the blocks: one, two, three, five, seven . . .

She sensed an invisible smile. *Just like a child's puzzle, isn't it?*

'Oh, shut up,' she said easily.

'What was that?'

'Nothing . . . I'm sorry, Louise. Yes, I see it now.'

'Look - what's exciting about finding this sequence of primes is that it means the signal is almost certainly *human*.'

'How do you know that, just from this pattern?'

'We don't know for sure, of course,' Louise said impatiently. 'But it's a damn good clue, Spinner-of-Rope. We've reason to believe the prime numbers are of unique significance to humans.

'The primes are fundamental structures of arithmetic - at least, of the discrete arithmetic which seems to come naturally to humans. We are compact, discrete creatures: I'm here, you are out there somewhere. One, two. Counting like this seems to be natural to us, and so we tend to think it's a fundamental facet of the Universe. But it's possible to imagine other types of mathematics.

'What of creatures like the Qax, who were diffuse creatures, with no precise boundaries between individuals? What of the Squeem, with their

group minds? Why should simple counting be *natural* to them? Perhaps *their* earliest forms of mathematics were continuous - or perhaps the study of infinities came naturally to them, as naturally as arithmetic to humans. With us, Cantor's hierarchy of infinities was quite a late development. And —'

Spinner barely listened. *Humans? Here, at the edge of time and space?* 'Louise, have you decoded any of the rest of it?'

'Well, we can figure some of it out,' Louise said defensively. 'We think, anyway. But remember, Spinner, we may be dealing with humans from a culture far removed in time from our own - by millions of years, perhaps. The people of such a distant future could be almost as remote from *us* as an alien species. Not even Lieserl has been able to help us work this out . . .'

'But you've made some progress. Right?'

Louise hesitated. 'Yes. We think it's a distress call.'

'Oh, great. Well, we're certainly in a position to help out god-humans from five million years after our birth.'

'Who knows?' Louise said dryly. 'Maybe we are. Anyway, that's what we're going to find out.'

. . . There was motion at Spinner's left. She turned.

Suddenly, the forest-dream man was *visible*. He was sitting there, quite casually - *outside* the cage - on the construction-material shoulder of the nightfighter. He wore no environment suit, nothing but a plain grey coverall. His hands were folded in his lap. Light - from some unseen source - caught the lines around his mouth, the marks of tiredness in his eyes.

At last he had emerged. Gently, he nodded to her.

She smiled.

' . . . Spinner?'

'I'm here, Louise.' She tried to focus her attention on her tasks; she reached for the hyperdrive waldo. 'Are you ready?'

'Yes.'

The nightfighter flickered through hyperspace. Travelling at more than a hundred thousand light-years per hour, the *Northern* edged around the torus of fragmented string loops, like a fly around the rim of a desert.

The journey took ten hours. As it neared its end Spinner-of-Rope took a brief nap; when she woke, she had her suit's systems freshen her skin, and she emptied her bladder.

She checked a display on her faceplate. Twenty jumps to go. Twenty more seconds, and—

Something vibrant-blue exploded out of space at her, ballooning into her face.

She cried out and buried her faceplate in her arms.

It's all right, Poole said softly.

'I'm sorry, Spinner-of-Rope,' Louise Armonk said. 'I should have warned you . . .'

Spinner lowered her arms, cautiously.

There was *string*, everywhere.

A tangle of cosmic string, rendered electric blue by the faceplate's false colouring, lay directly ahead of the ship. Cusps, moving at lightspeed, glittered along the twisted lengths. She leaned forward and looked up and down, to left and right; the threads of string criss-crossed the sky as far as she could see, a textured wall across space. Looking deeper into the immense structure, Spinner saw how the individual threads blurred together, merging into a soft mist at infinity.

The string loop was a barrier across the sky, dividing the Universe in two. It was quite beautiful, she thought - but *deadly*. It was a cosmic web, with threads long enough to span the distances between stars: a web, ready to trap her and her ship.

And, she knew, this was just one thousand-light-year fragment, among thousands in the torus . . .

'Lethe,' she said. 'We're almost *inside* this damn thing.'

'Not quite,' Louise said. Her voice, nevertheless, was tight, betraying her own nervousness. 'Remember your distance scales, Spinner. The string loops in this toroidal system are around a thousand light-years across. We're as far from the edge of that loop as the Sun was from the nearest star.'

'Except,' Mark Wu cut in, 'that the loop *has* no easily definable edge. It's a tangle. Cosmic string is damn hard to detect; the display you're looking at, Spinner, is all Virtual reconstruction; it's just our best guess at what lies out there.'

'Then are we at risk by being here?' Spinner asked.

Of course, Michael Poole said.

'No,' Louise said.

‘Yes,’ Mark said. ‘Come on, Louise. Spinner, we’re working to minimize the risks. But the danger is there. Spinner, you need to be ready to react - to get us out of here, quickly. We have escape routines laid into the waldoes, for both hyperdrive and discontinuity drive.’

‘I’ll be ready,’ she said calmly. ‘But *why* are we here? Is the human signal coming from somewhere in there - inside the string?’

‘No,’ Louise said. ‘Thankfully. Spinner, the signal is coming from the system of a neutron star - just a few light-hours away from here. We’ve laid in—’

‘—a discontinuity-drive sequence into the waldoes,’ Spinner said dryly. ‘I know.’ She reached for her controls. ‘Tell me when you’re ready, Louise.’

Poole looked tired, his brown eyes deep in a mesh of wrinkles. *You know, I worked with Louise Armonk*, he said. He smiled. *And here we are, together again. Small world, isn’t it? She was a good engineer. I guess she still is.*

‘I know you decided to close your wormhole time bridge,’ Spinner said. ‘Tell me what happened to you.’

Poole sat, apparently relaxed, on the ‘fighter shoulder; his eyes were closed, his head bent forward. *I remember the lifedome of my GUTship entering the Interface*, he said slowly. *There was light - like fire, blue-violet - from all around the lip of the dome. I knew that was the flesh of the Spline, burning up against the Interface’s exotic-matter framework. I remember - a sense of loss, of alienation.*

‘Loss?’

I was passing out of my time frame. Spinner-of-Rope, each of us - (he raised translucent hands) - *even I - is bound into the world by quantum functions. I was linked non-locally to everything I had touched, seen, tasted . . . Now, all those quantum bonds were broken. I was as alone as any human had ever been.*

I engaged the hyperdrive.

Bits of the wormhole seemed to fall away. I remember streams of blue-white light . . . I almost believed I could feel those hard photons, sleeting through the lifedome.

Spacetime is riddled with wormholes: it is like a sheet of flawed glass, crazed by cracks. When Poole set off his hyperdrive inside the wormhole, it was as if someone had smashed at that flawed glass with a hammer. Cracks

exploded out from the point of impact and widened; they joined up in a complex, spreading network of cracks, a tributary pattern that continually formed and reformed as spacetime healed and shattered anew.

The spacetime cracks opened up like branching tunnels, leading off to infinity . . . Poole smiled, self-deprecating. *I started to wonder if this had been a good plan, after all*.

The pod sailed down from the *Northern*'s lifedome.

Lieserl sat in a Virtual projection of a pod couch beside Mark Wu; ahead of them blind Uvarov was swathed in his blankets, his cavern of a mouth gaping, his breath a rattle. The huge discontinuity-drive wings of the nightfighter spread over the pod like the vaulted roof of some immense church.

Far below the pod revolved the bleak, airless planet to which they were descending. Staring down as the small island of solidity loomed out of the glowing fog, Lieserl had a sudden - and quite absurd - feeling of vertigo. She felt as if she were suspended, in this couch, without protection far above the planet's surface; she had an impulse, which she suppressed with determination, to grip the sides of her couch.

Vertigo . . . After all her experiences inside the Sun, and despite her perfect knowledge that she couldn't be harmed even if the pod exploded here and now - since she was little more than a Virtual projection from the *Northern*'s main processors, with augmentation from the pod's processor banks - after all that, she had vertigo.

Still, she thought, it was comforting to know that she'd retained enough humanity to be just a *little* scared. Maybe she should tell Mark; it might make him think a little better of her.

Beyond the pod's clear hull, the neutron star system was a huge tableau all around them.

The neutron star itself was a tiny, fierce yellow-red ball. It had a companion - a normal star - and it was surrounded by a ring of gas, which glowed softly. And there were several planets, orbiting the neutron star, inside the smoke ring.

In fact, the anomalous signal was coming from one of the planets, the little world towards which Lieserl was now descending.

The nightfighter had dropped them *into* the ring of smoke which orbited the star. It was like descending into fog. Close to the pod Lieserl could see

dense swirls of the ring gas - clumps and eddies of turbulent stuff - and, beyond that, the rest of the ring was a band of pale light bisecting the Universe. She could see the neutron star itself, a small, hard coal glowing yellow-red at the heart of this ring of smoke. Beside it hung its companion star - huge, pale, distorted into a squat egg-shape by the neutron star's fierce gravitational field. Tendrils of gas led from the carcass of the companion and reached blindly towards the neutron star.

And beyond *that*, tilted crazily compared to the gas torus, was a starbow.

This neutron star was moving with extraordinary speed: it plummeted across space at close to the speed of light. As a result of this high velocity, the neutron star and its system were the only visible objects in Lieserl's Universe. *All* of the rest - the blue-shifted galaxies, the nearby wall of cosmic string - was compressed into that pale starbow, a band of light around the equator of the star's motion. And away from the starbow, there was only darkness.

Uvarov tilted his head, and the pod's internal lights cast shadows across his imploded eye-sockets. 'Tell me what you see,' he hissed.

'I see a neutron star,' Mark said. 'An unexceptional member of its species. Just ten miles across, but with a mass not much less than Sol's . . . What has made this one unusual is the fact that it has a companion, which is - was - a normal star.'

Before Mark, a Virtual diorama of the neutron star system glittered into existence; the globes of the neutron star and its companion were criss-crossed by lines of false colour, showing - Lieserl suspected - gravitational gradients, lines of magnetic flux, and other observables. Bits of text and subsidiary graphics drifted in the air beside the glowing objects.

'Once,' Mark said, 'these stars were a binary pair - a spectacular one, since the neutron star must have been a brilliant giant. Somehow, the companion survived the giant's supernova explosion. But the remnant of that explosion - the neutron star - is killing its companion, just the same.' He pointed. 'The neutron star's gravity well is sucking out material from the companion . . . Look at it, Lieserl; those delicate-looking tendrils of smoke could swallow Jupiter. Some of the companion's lost matter is falling onto the neutron star itself. And as the mass down there increases, the rotation of the neutron star will glitch - the neutron star must suffer starquakes, quite

regularly. The rest of the gas is drifting off to form this ring we're in, orbiting the neutron star.'

'Do you think the birds caused the supernova explosion, Mark?' Lieserl asked.

He shook his head. 'No. The system is too stable . . . I think the explosion took place long before the birds took an interest.'

'And the companion?'

He smiled, peering up at the complex sky. 'Lieserl, that is one star the birds don't *need* to kill. The neutron star is doing their work for them.'

The Virtual representation of the neutron star expanded before his face, expelling the companion and the other features from the diorama. Mark peered in to a complex knot of light at what looked like one of the star's magnetic poles.

Lieserl looked away. The planet wasn't far below, now; slowly it was turning from a ball of rock, suspended in emptiness, into a landscape - bare, bleak, riven by cracks.

'What about the planets?' Lieserl asked. 'How could *they* have survived the supernova?'

'My guess is they didn't,' Mark said, still staring at the star's pole. 'I think they probably formed *after* the explosion: coalesced from material in the gas ring, and from debris left over from the explosion itself - maybe from the previous planetary system, if there was one . . . *Lieserl*. Lethe. Look at this.'

'What?'

The neutron star Virtual representation swept across the cabin towards her; the little knot of light at the pole was thrust in her face. Lieserl flinched, but stared gamely into the glowing, complex image.

Mark was grinning, his voice animated by excitement. 'Do you see it?'

'Yes, Mark,' she said patiently, 'but you're going to have to tell me *what* I'm seeing.'

'There's a major disturbance in the gravitational gradients at that magnetic pole.' Arrows clustered around the star's pole, forming themselves into a two-dimensional plane. 'Can you see it?'

'What about it?'

Mark sounded impatient. 'Lieserl, I think there's a sheet discontinuity down there. A two-dimensional defect. *A domain wall*, inside the star . . .'

Lieserl frowned. ‘That’s impossible.’

‘Of course it is.’ He grinned. ‘How could a domain-wall defect form within the structure of a neutron star? Impossible . . . unless it’s been put there.’

Uvarov’s ruined mouth stretched into a smile. ‘*Put* there?’

‘We wondered how come this neutron star was out here on its own - away from any galaxy, and moving so bloody fast. Well, now we know.’

Lieserl found herself laughing. ‘This is *outrageous*. Are you suggesting —’ ‘Yes,’ he said seriously. ‘I think someone, maybe human, installed a discontinuity drive at the magnetic pole of this neutron star, and used it to hurl the whole system across space at close to lightspeed.’

‘But that’s absurd,’ she said. ‘Why should anyone *do* such a thing?’

Now Uvarov laughed, at her. ‘Still the rationalist, Lieserl, after all our experiences? Well, perhaps we will soon learn the answer to such questions. But of this I’m sure - that it has some connection to this endless, bloody war in Heaven we’ve wandered into.’

The pod’s descent bottomed out, now, and the little ship sailed over the planet’s battered landscape.

At length, Mark said, ‘We’re over the source of the signals . . . *There*,’ he said suddenly. ‘Can you see it?’

Uvarov tilted his head on its thin neck.

Lieserl peered down.

‘A structure, Mark said. ‘There on the surface . . . Some kind of building. Come on; I’ll take us down.’

I fell into the future, Spinner-of-Rope, through a network of transient wormholes that collapsed after me. My instruments were smashed, but I knew my lifedome must have been awash with high-energy particles and gravity waves. I was as helpless as a new-born babe.

Poole sat in raw vacuum on the shoulder of the nightfighter with his legs tucked beneath him, lotus-style, his hands resting comfortably, palms-up, on his knees. Spinner could see a grooved pattern, moulded mundanely into the soles of his shoes.

He said, *I fell across five million years . . .*

Mark Wu - or rather, one of his Virtual consciousness foci, on the *Northern* - peered at the loop of cosmic string through the hundred eyes of

the ship’s sensors. He wasn’t happy: his multifaceted view was muddy, imprecise.

The trouble was, the ship was in orbit around this damn neutron star planet, which was falling through space so fast the observable Universe was relativity-shifted into a skinny, pale starbow. It was like being taken back to the *Northern*’s thousand-year flight. Mark had to deconvolve out the effects of the near-lightspeed motion: to unsmear the Universe back out of the starbow once more.

Mark had subroutines to achieve this. But it was, he thought uneasily, a little like unscrambling an egg. The resulting images weren’t exactly *clear.*

Inside his box of processors, Mark Wu worked on nanosecond timescales. He could process data at several millions of times the rate achievable by humans, and it sometimes took an effort of will to come back out of there and return to the glutinous slowness of the human world.

It was seven centuries since his physical death and downloading into the AI banks of the *Northern*, and he’d steadily got more proficient at non-human operation. Right now, for instance, he was maintaining a conventional human-Virtual on the pod with Lieserl and Uvarov, and another with Louise in the *Great Britain*, in parallel with his direct interfacing with the *Northern*’s systems.

Running these multiple consciousness foci felt odd, but he’d grown used to enduring minor discomforts when the need arose.

And there was need now.

Maybe he should have tried to veto this trip to the neutron star, he thought. It had brought the *Northern* close - too damn close - to this loop-cloud of cosmic string. When dealing with an object a thousand light-years across, he thought sourly, a separation of a mere handful of light-years didn’t seem nearly sufficient.

Mark split off a series of more subordinate foci, and set to scanning overlapping sectors of the sky.

His image of the Universe was a mosaic, constructed of the fragments supplied to him by the sensors; he imagined it was a little like looking out through the multi-faceted eyes of a fly. And the Universe was criss-crossed, *everywhere*, by string double-image paths - it was as if the sky were some huge dome of glass, he thought, marred by huge cracks.

By studying the double images of stars and galaxies, Mark was able to check on the near-lightspeed velocities of the string segments; he constantly updated the internal model he maintained of the local string dynamics, trying to ensure the ship stayed a safe distance away from—

A watchful subroutine sounded an alarm. It felt to Mark like a prickling of vague unease, a shiver.

. . . *There was movement*, in the field of view of one sensor bank. He swivelled his consciousness, fixing most of his attention on the anomaly picked up by that sensor bank.

Against a background provided by a beautiful, blue-stained spiral galaxy, he saw a *double* track of multiple stellar images.

There had to be *two* lengths of string there, he realized: two arcs of this single, huge loop of string, no more than light-hours apart. And he could see from the melting flow of the star images that the arcs were sliding past each other in opposite directions; maybe eventually they would intersect.

In some places there were *three* images of single stars. Light from each of those stars was reaching him by three routes - to the left of the string pair, to their right, and straight through the middle of the strings.

The cause of the alert was obvious. All along the double tracks, he saw, star images were sliding, as if slipping across melting spacetime. These strings must be *close* - maybe even within the two-light-year limit he'd imposed on himself as a rough safety margin.

He ran a quick double-check on the routines he'd set up to monitor the strings' distance from the ship. He wondered if he ought to tell Louise and Spinner about this . . .

Now, suddenly, alarm routines shrieked warnings into his awareness. It was like being plunged into an instant panic; he felt as if adrenaline were flooding his system.

What in Lethe—

He interrogated his routines, briskly and concisely. It took only nanoseconds to figure out what was wrong.

The pair of string arcs were closer than he'd thought at first. His distance-estimation routines had been thrown by the interaction of the two strings, by the way the pair jointly distorted star images.

So the strings were closer than his monitoring systems had told him. The trouble was, he couldn't tell how close; maybe they were a *lot* closer.

Damn, damn. I should have anticipated this. Feverishly he set off a reprogramming routine, ensuring that for the future he wouldn't be fooled by multiple images from pairs of string lengths like this - or, indeed, from any combination.

But that wasn't going to help now.

He ran through a quick hack procedure, trying to get a first-cut estimate of the strings' true distance . . .

He didn't believe the answer. He modified the procedure and ran it again.

The answer didn't change.

Well, so much for my two-light-year safety zone.

The string pair was only around ten million miles from the *Northern* - *less than a light-minute.*

One of the pair of strings was receding - but the other was heading straight for the ship.

He ran more checks. There was no error.

In fifty seconds, that encroaching string would hit the *Northern.*

He burst out of the machinery and back into the world of humans. With impatience he waited for pixels to congeal out of the air, for his face to reassemble; he felt his awareness slow down to the crawl of humans.

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29

Five million years after the first conflict between humans and Qax, the wreckage of a Spline warship had emerged, tumbling, from the mouth of a wormhole that blazed with gravitational radiation. The wormhole closed, sparkling.

The wreck - dark, almost bereft of energy - turned slowly in the stillness. It was empty of life.

Almost.

I'm still not sure how I survived. But I remember - I remember how the quantum functions came flooding over me. They were like rain-drops; it was as if I could see them, Spinner-of-Rope. It was painful. But it was like being born again. I was restored to time.

It hadn't taken Poole long to check out the status of the derelict his craft had become. There had been power in the lifedome's internal cells, sufficient for a few hours, perhaps. But he had no motive power - not even a functioning data link out of the lifedome to the rest of his ship.

I remember how dead the Universe looked. I couldn't understand how the stars had got so old, so quickly; I knew I couldn't have fallen more than a few million years.

But I knew I was alone. I could feel it.

I made myself a meal. I drank a glass of clear water . . . His face, softly translucent, was thoughtful. *Do you know, I can remember the taste of that water even now. I had a shower . . . I was thinking of reading a book.*

But the lights went out.

I felt my way back to my couch. I lay there. It started getting colder. I wasn't afraid of death, Spinner-of-Rope. Strangely, I felt renewed.

'But you didn't die,' she said. 'Did you, Michael?'

No. No, I didn't die, said Poole.

And then, a ship had come.

Poole, dying, had stared up in wonder.

It was something like a sycamore seed wrought in jet-black. Night-dark wings that spanned hundreds of miles loomed over the wreck of Poole's GUTship, softly rippling.

'A nightfighter,' Spinner breathed.

Yes. I got colder. I couldn't breathe. But now I didn't want to die. I wanted to live just a little longer - to understand what this meant.

And then—

'Yes?'

And then, something had plucked Poole from the wreck. It was as if a giant hand had cupped his consciousness, like taking a flame from a guttering candle.

And then it spun me out . . .

Poole had become discorporeal. He no longer even had a heartbeat.

He felt as if he had been released from the cave of bone that had been his head.

I believe I became a construct of quantum functions, he said. *A tapestry of acausal and nonlocal effects . . . I don't pretend to understand it. And my companion was still there. It was like a huge ceiling over me.*

'What was it?'

Perhaps it was Xeelee. Or perhaps not. It seemed to be beyond even the Xeelee - a construct by them, perhaps, but not of them . . .

Spinner-of-Rope, the Xeelee were - are - masters of space and time. I believe they have even travelled back through time - modified their own evolutionary history - to achieve their huge goals. I think my companion was something to do with that programme: an anti-Xeelee, perhaps, like an anti-particle, moving backwards in time.

I sensed - amusement, Poole said slowly. *It was amused by my fear, my wonder, my longing to survive.* She heard the faded ghost of bitterness in his voice.

After a time, it dissolved. I was left alone. And, Spinner, I found I could not die.

At first, I was angry. I was in despair. He held up his glowing hand and inspected it thoughtfully, turning it round before his face. *I couldn't understand why this had been done to me - why I'd been preserved in this grotesque way.*

But - with time - that passed. And I had time: plenty of it . . .

He fell silent, and she watched his face. It was blank, expressionless; she felt a prickle of fear, and wondered what experiences he had undergone, alone between the dying stars.

'Michael,' she said gently. 'Why did you speak to me?'

His bleak expression dissolved, and he smiled at her. *I saw a human being*, he said. *A man, dressed in skins, frost-bitten, in a fragile little ship . . . He came plunging through a wormhole Interface, uncontrolled, into this hostile future.*

It was an extraordinary event . . . So I - returned. I was curious. I probed at the wormhole links - and found you, Spinner-of-Rope.

Spinner nodded. 'He was Arrow Maker. He was my father,' she said.

Michael Poole closed his eyes.

' . . . Spinner-of-Rope,' Louise Armonk said. She sounded urgent, concerned.

'Yes, Louise.'

'I don't know what in Lethe is happening in that head of yours, but you'd better get it clear fast.' Spinner heard Louise issue commands over her shoulder. ' . . . We've got a problem.'

'What kind of problem?'

'Listen to me, Spinner. Here's what you must—'

Louise's voice died, abruptly.

'Louise? Louise?'

There was only silence.

Spinner twisted in her couch. Behind her, the bulk of the lifedome loomed over the clean lines of the nightfighter, a wall of glass and steady light.

But now a soft webbing, a mesh of barely visible threads, lay over the upper levels of the lifedome.

'Lethe,' Spinner hissed. 'That's *string*.'

For the first time in several years, the Decks were filled with the wail of the klaxon.

Morrow, hovering in the green-tinged air close to Deck Two, straightened from his work. His back ached pleasurably, and there was warm dirt and water on his hands; he felt a fine slick of sweat on his forehead.

He looked around vaguely, seeking the source of the alarm.

Milpitas, his sleeves rolled up and the deep scars of his face running with sweat, studied him. The Planner fingered a handful of reeds which protruded from the spherical pond. 'Morrow? Is something wrong? Why the klaxon?'

‘I don’t know, Planner.’

The sound of the klaxon was deafening - at once familiar and jarring, making it hard to think. Morrow looked around the Decks, at the tranquil, three-dimensional motion of people and ‘bots as they went about their business; in the distance the shoulders of the Temples loomed over the grass-covered surfaces. It all looked normal, placid; he felt relaxed and safe.

Morrow was working with Milpitas within what had once been Poole Park. They were still trying to establish their zero-gee water feature. Milpitas and Morrow had set a ball of earth on a fine pole, attached it to the Deck surface, and surrounded it with a globe of water five feet across, restrained by a fine skin of porous plastic. Reeds and lilies were planted in the ball of earth, and were already growing out of the water surface. Their vision was that the reeds and lilies - perhaps plaited in some way - together with the water’s natural surface tension would eventually suffice to hold the pond together, and they could abandon the plastic membrane.

Then, at last, they could populate the pond, with fish and frogs.

It was a small, almost trivial project. But it had actually been Milpitas’ idea, and Morrow had been glad to offer to work on it with him, as part of what he thought of as Milpitas’ rehabilitation to zero-gee. Anything that got the Planner - and those he influenced - thinking and working in zero-gee conditions was a good thing, in Morrow’s view.

‘Morrow.’ Louise Armonk’s voice emerged from a point in the air. It was loud, urgent in his ear. ‘*Morrow*. Can you hear me?’

Morrow looked down to the grass-coated floor of the Deck; he knew that Louise was somewhere below his floor in her old steam-ship, studying the neutron star system. ‘What is it, Louise?’

‘Morrow, you have to get away from there.’

‘But, Louise—’

‘*Move*, damn it. *Anywhere*.’

Milpitas was studying him. ‘Well? *Is* there a problem?’

‘Milpitas. *Come*.’

Morrow grabbed the Planner’s robe at the shoulder. He flexed his knees, planted his feet squarely against the Deck surface, and pushed himself into the air, dragging Milpitas after him. Looking down, he saw the spherical pond recede below them.

Air resistance brought them to a stop in mid-air, five yards above the Deck surface.

Morrow released the Planner. Milpitas' arms were still wet to the elbow, and his bony legs protruded from beneath his robe.

'Louise? All right, we've moved. *Now* will you tell me what's wrong?'

'We're in trouble.' Morrow heard panicky shouting behind Louise's voice, and flat, even commands being issued by Mark. 'We're in the path of a section of string . . . If our projections are correct, it's going to pass right through Poole Park.'

Morrow stared around at the Decks. Suddenly the metal walls of this place, coated with plants and people, seemed impossibly fragile. 'But how can that be? I thought that loop was light-years away.'

'So did we, Morrow. We're trying to confirm the string's trajectory so we can program the discontinuity-drive waldoes, and—'

But Louise's voice was gone.

Lieserl and Mark stood on the surface of the neutron star planet, in Virtual mockups of environment suits. They looked at each other uncertainly.

'Something's wrong,' Lieserl said.

'I know.' Through his sketch of a faceplate, Mark's expression was lifeless, cold; Lieserl knew that meant he was diverting processing power to higher priorities.

The surface under Lieserl's feet was pumice-grey and looked friable. Beside them, waiting patiently, was a 'bot, a fat-wheeled trolley fitted with a few articulated arms and sensors. The dust of the planet had smeared the 'bot's wheels with grey, Lieserl saw.

A few yards away their pod was a fat, gleaming cylinder; within the pod's clear walls Lieserl could see Uvarov, wrapped in his blanket.

The sky was fantastic. The gas ring was a belt of smoke which encompassed the world, all the way to the horizon. The far side of the ring was a pale strip of white, bisecting the sky. She could just make out the neutron star itself, a tiny, baleful blood-pearl threaded onto the line of smoke; and its huge companion was an attenuated ball of yellow-grey mist, bleeding gas onto its malevolent twin.

The starbow was a crack across the emptiness away from the plane of the ring; high above her head, Lieserl could see the gleaming lights of the

Northern’s lifedome, in the ship’s remote orbit around the planet.

The building they had detected from orbit was a tetrahedron, twenty feet tall, sitting impassively on the surface.

Lieserl felt frustrated. Had they come so far, approached this astonishing mystery, so closely, only for their comms links to fail?

She tapped her helmet. ‘I feel as if I’ve gone deaf,’ she said.

‘Me too.’ Mark smiled thinly, some of the expression returning to the waxy image of his face. ‘Well, we’ve certainly lost the voice links from the *Northern*.’ He looked up uneasily. ‘I wonder what in Lethe is happening up there.’

‘Maybe they are trying to recall us.’

Mark shrugged. ‘Or maybe not.’ He looked at her. ‘Lieserl, do you *feel* any different? As far as I can tell the links to the central processors back on the *Northern* are still functioning - although I’m working read-only at the moment.’

She closed her eyes and looked inwards. ‘Yes. It’s the same for me.’ Read-only meant she couldn’t pass her impressions - the new memories she was laying down - back to the processors on the *Northern* which were now the core of her awareness. She looked up at the *Northern*’s steady yellow light. ‘Do you think we should go back?’

Mark hesitated, looking back at the pod.

Uvarov stirred, like an insect in some glass cocoon, Lieserl thought. ‘I’m the only one of us who’s in genuine danger here,’ he rasped. ‘The two of you are just projections. Virtual phantasms. You are only wearing those damn suits as crutches for your psyches, in Lethe’s name. Even if this planet exploded now, all you’d lose would be a few hours of *data input*.’ He snarled the last words like an insult.

‘What’s your point, Uvarov?’ Mark said.

‘Get on with your search,’ Uvarov snapped. ‘Stop wasting time. There is nothing you can do about whatever problems are occurring at the *Northern*. For Life’s sake, look at the bigger picture. The baryonic Universe is coming to an end. What can happen to make things worse than that?’

Mark laughed, a little grimly. ‘All right, Doctor. Come on, Lieserl.’ They trudged over the surface towards the structure.

The klaxon died. The sudden silence was shocking.

Morrow tapped his ear - he thought self-deprecatingly, as if *that* would restore the Virtual projection of Louise's voice.

Milpitas had left his side. With surprising agility the Planner had *swum* down through the air, away from Morrow and back towards the pond.

There was a grind of metal, high above him.

He heard a single scream - an unearthly sound that echoed from the walls, rattling through the silence of the Decks. And now there was another scream - but this time, Morrow realized, it was the product of no human voice; the shriek was of air escaping from a breached hull.

He peered up into the shining air, looking for the breach.

There. Against one wall, mist was gathering over a straight-line gash which sliced through a field of dwarf wheat. A literacy-recovery class had been working there; now, people scrambled through the air, away from the billowing fog, screaming.

He heard Milpitas grunt. Morrow looked down.

Milpitas stared down at his midriff and clasped his hands over his belly. His scarred face was creased into an expression of disapproving surprise, and - in that final instant - Morrow was reminded of Planner Milpitas as he had once been: tough-minded, controlling, forcing the world to bend to his will.

Then Milpitas folded forward, around a line just below his solar plexus. For the first fraction of a second it looked as if he were doubling over in pain - but, Morrow saw with mounting horror, *Milpitas kept on folding*, bending until Morrow could hear the crackle of crushed ribs, the deeper snap of vertebrae.

There was nothing visible, nobody near Milpitas; it was as if he were inflicting this unimaginable horror on himself, or as if the Planner's body had been crumpled in some huge, transparent fist.

Then, it seemed that that same huge fist - powerful, irresistible, invisible- grabbed Morrow himself and hurled him down towards the Deck.

He screamed and wrapped his arms around his head.

He smashed into the spherical pond, so lovingly constructed by himself and Milpitas. Reeds and lilies slapped at his face and arms, and brackish water forced itself into his eyes and mouth.

Then he was through the pond, and the Deck surface hurtled up to meet him, unimaginably hard.

The tetrahedron was liberally coated with dust. Mark had the ‘bot roll forward and wipe the building’s surface, tentatively. Beneath a half-inch thickness of the dust, the material of the tetrahedron’s construction was milky-white, seamless. The triangular faces gave the structure the look of something flimsy, or temporary, Lieserl thought - like a tent of cloth.

It had been Mark’s suggestion for them to approach this structure in human form. ‘We want to know - among other things - if *people* built this thing, and why,’ he had argued. ‘How else are we going to get a genuine feel for the place, unless we look at it through human eyes?’ Lieserl hadn’t been sure. To restrict themselves to human form - more than was necessary to interface with Uvarov - had seemed inefficient. But, staring at the structure now, Lieserl realized what a good idea it had been.

‘It’s a tetrahedron,’ Lieserl observed. ‘Like an Interface portal.’

‘Well, that’s a characteristic signature of human architecture,’ Mark murmured. ‘Doesn’t mean a thing, by itself, though. And from the thickness of that dust, I guess we know this place has been abandoned for a long time.’

‘Hmm. The door looks human enough.’

The door was a simple hatchway seven feet tall and three wide, set at the base of one of the tetrahedron’s triangular walls. There was a touchpad control, set at the waist height of an average human.

Mark shrugged. ‘Let’s try to open it.’

The ‘bot rolled forward silently, bouncing a little on the rough surface despite its fat, soft wheels. It extended an arm fitted with a crude mechanical grab, tapped cautiously at the door, and then pushed at the control pad.

The door slid aside, into the fabric of the tetrahedron. A puff of air gushed out at them. A few scraps of dust tumbled out, and, when the air had dispersed, the dust fell in neat parabolae to the surface.

Beyond the door there was a small rectangular chamber, big enough for four or five people. The walls were of the same milky substance as the outer shell, and were unadorned. There was another door, identical to the first, set into the far wall of the chamber.

‘At least we know there’s still power,’ Mark said.

‘This is an airlock,’ Lieserl said, looking inside the little chamber. ‘Plain, functional. Very conventional. Well, what now? Do we go in?’

Mark pointed.

The ‘bot was already rolling into the airlock. It bumped over the lip, and came to a halt at the centre of the lock.

Lieserl and Mark hesitated for a few seconds; the ‘bot waited patiently inside the lock.

Mark grinned. ‘Evidently, we go in!’

He held out his arm to Lieserl. Arm in arm, they trooped after the robot into the lock.

The lock, containing the ‘bot and the two of them, was a little cramped. Lieserl found herself shying away from the ‘bot’s huge, dusty wheels, as if she might get her environment suit smeared.

The ‘bot reached out and pushed the control to open the next door. There was a hiss of pressure equalization.

The ‘bot exposed an array of chemical sensors, and Mark cracked open his faceplate and sniffed elaborately.

‘Oh, stop showing off,’ Lieserl said.

‘Air,’ he said. ‘Earth-normal, more or less. A few strange trace elements. No unusual smells - and quite sterile. We could breathe this stuff if we had to, Lieserl.’

The lock’s inner door swung open, revealing a larger chamber. The ‘bot pushed a lamp, magnesium-white, into the chamber, and light flared from the walls. Lieserl caught a glimpse of conventional-looking furniture: beds, chairs, a long desk. The chamber’s walls sloped upwards to a peak; this single room looked large enough to occupy most of the tetrahedral volume of the building.

The ‘bot rolled forward. Mark stepped briskly out of the lock and into the chamber; Lieserl followed.

‘Mark Wu? Lieserl?’ Uvarov’s rasp was loud in her ear.

‘Yes, Doctor,’ Lieserl replied. ‘We hear you. You don’t need to shout.’

‘Oh, *really*,’ Uvarov said. ‘Unlike you, I didn’t simply assume that our transmissions would carry through whatever those walls are made of.’

Lieserl smiled at Mark. ‘Were you worried about us, Uvarov?’

‘No. I was worried about the ‘bot.’

Lieserl stepped towards the centre of the main chamber and looked around.

The walls of the tetrahedral structure sloped up around her, coming to a neat point fifteen feet above her head. She could see partitioned sections in two of the corners. Bedrooms? Bathrooms? A galley, perhaps?

The ‘bot scurried around the edge of the room, its multiple arms probing into corners and edges. It left planet-dust tracks behind itself.

The main piece of furniture was a long desk, constructed of what looked - for all the world - like wood. Lieserl could see monitors of some kind inlaid into the desk surface. The monitors were dead, but they looked like reasonably conventional touch-screens. Lieserl reached out a gloved hand, wishing she could feel the wood surface.

There were *chairs*, in a row, before the desk - four of them, side by side. These were obviously of human construction, with upright backs, padded seats, and two arms studded with controls.

‘Mark, look at this,’ she said. ‘These chairs would fit either of us.’

Mark had found something - two objects - at the end of the desk; he had the ‘bot roll across and pick the objects up. Mark’s face was lit with wonder; he bent to inspect the first object, held before him in the ‘bot’s delicate grab. ‘This is some kind of stylus,’ he said. ‘Could be something as simple as an ink pen . . .’ The ‘bot held up the second object. ‘But this thing is unmistakable, Lieserl. Look at it. It’s a *cup*.’ His hands on his knees, he looked up at her. ‘The builders of this place must have been gone a million years. But it’s as if they just stepped outside.’

Uvarov rasped, ‘*Who?* I wish you’d speak to me, damn it. What have you found?’

Mark and Lieserl looked at each other.

‘People,’ Lieserl said. ‘We’ve found people, Uvarov.’

Mark sat with Louise in her oak-panelled bedroom inside the *Great Britain*. Mark had called up a Virtual schematic of the *Northern*’s lifedome; the schematic was a cylinder three feet tall, hovering over her bed. The schematic showed a lifedome which sparkled with glass and light, and the greenery of the forest Deck glowed under the skydome at the crown.

Louise felt something move inside her; the lifedome looked so beautiful - so fragile.

She stared around at the familiar polished walls of her room - it was actually two of the old ship’s state rooms, knocked together and converted. Here was the centre of her world, if anywhere was; here were her few

pieces of old furniture, her clothes, her first, antique data slate - which still contained the engineering sketches of the *Great Britain* she'd prepared during her first visit to the old ship as a teenager, five million years and half a Universe away. If only, she thought, if only she could pull this room around her like some huge wooden blanket, never to emerge into the complex horrors of the world . . .

But here was Mark, politely sitting on the corner of her bed and watching her face. And now he said quietly: 'Here it comes, Louise.'

She forced herself to look at the Virtual of the lifedome.

Mark pointed at the mid-section of the lifedome. A horizontal line of blue-white light appeared; it shimmered balefully against the clear substance of the lifedome, like a sword blade.

'The string has sliced into us from this side. I guess we can be grateful the relative velocity was actually quite low . . .'

The string cut easily into the substance of the dome, like a hot wire into butter.

Louise, watching in the silence of her room, felt as if the string were cutting into her own body; she imagined she could hear the shriek of lost air, the screams of her helpless human charges.

Mark looked blank as his processors worked. He said rapidly, 'The wake took a slice out of the hull tens of yards thick. *Lethe*. We're losing a lot of air, Louise, but the self-repair systems are working well . . . A lot of our infrastructure has gone down quickly - too damn quickly; I think we need to take a look at our redundancies again, if we make it through this . . .'

'And the Decks? What's happening in there?'

He hesitated. 'I can't tell, Louise.'

She felt useless; the control panels in the room mocked her with their impotence. She felt the blame for this ghastly accident fall on her shoulders, like a tangible weight. *I'm responsible for bollixing up those distance-evaluation routines. I'm responsible for insufficient redundancy - and for losing touch with Spinner-of-Rope in the cage, just when we need her most. If only I could talk to Spinner, maybe she could get us out of here. If only—*

'The geometry of the string is just as theory predicted,' Mark said. 'I'm getting measurements of pi in the regions around the string . . . 3.1402,

compared to the flat-space value of 3.1415926 . . . The conical space has an angle deficit of four minutes of arc.

‘At this moment we have a quarter-mile length of string, actually inside the lifedome, Louise. That’s a total mass of four hundred billion *billion* tons.’ Mark looked bemused. ‘Life, Louise, think about that; that’s the mass of a fair-sized moon . . .’

Her introspection was futile. The destruction of the lifedome could be - suddenly - mere seconds away. And, in the end, she was helpless. *All I could do, in those last, frantic moments, was sound the damn klaxon . . .*

There was a whisper of spider-web light above Spinner. She could *see* how the string made the stars slide across the sky, just above the lifedome. The encroaching string was like the foregathering of some huge, supernatural storm around the *Northern.*

Don’t be afraid . . .

She twisted in her couch and tightened her restraints. ‘What in Lethe do you expect me to be?’ she yelled at Poole. ‘We’ve been hit by a length of cosmic string, damn it. This could finish us off. I have to get us out of here.’ She placed her hands on the waldoes. ‘*But I don’t know what to do*. Louise? Louise, can you hear me?’

You know she can’t.

Feverishly, Spinner said, ‘Maybe we’re already hit; maybe that’s why the connection went down. But what if she managed to program a routine into the waldoes before we lost the connection? Maybe—’

Come on, Spinner-of-Rope. You know that’s not true.

‘But I have to move the ship!’ she wailed. The thump of her heartbeat sounded impossibly loud in the confined space of the helmet. ‘Can’t you see that?’

Yes. Yes, I see that.

‘But I don’t know *how* - or *where* - without Louise . . .’

A hand rested over hers. Despite the thickness of her glove fabric, she could feel the warm roughness of Michael Poole’s palm.

I will help you. I’ll show you what you must do.

The invisible fingers tightened, pushing her hands against the waldoes. Behind her, the nightfighter opened its wings.

Morrow, crumpled against the Deck beside the crushed body of Planner Milpitas, stared up into the wake of the cosmic string.

The structure of the middle Decks was fragile; it simply imploded into the string wake. Morrow saw homes which had stood for a thousand years rip loose from the Deck surfaces as if in the grip of some immense tornado; the buildings exploded, and metal sheets spun through the air. The newer structures, spun across the air in zero-gee, crumpled easily as the wake passed. Much of the surface of Deck Two was torn loose and tumbled above him, chunks of metal clattering into each other. Morrow saw patterns of straight lines and arcs on those fragments of Deck: shards of the soulless circular geometry which had dominated the Deck's layout for centuries.

People, scattered in the air like dolls, clattered against each other in the wake. The string passed through a Temple. The golden tetrahedron - the proudest symbol of human culture - collapsed like a burst balloon around the path of the string, and shards of gold-brown glass, long and lethal, hailed through the air.

And now the string passed through another human body, that of a hapless woman. Morrow heard the banal, mundane sounds of her death: a scream, abruptly cut off, a moist, ripping sound, and the crunch of bone, sounding like a bite into a crisp apple.

The woman's body, distorted out of recognition, was cast aside; tumbling, it impacted softly with the Deck.

The wake of a cosmic string . . . The wake was the mechanism that had constructed the large-scale structure of the Universe. It was the seed of galaxies. *And we have let it loose inside our ship*, Morrow thought.

Once the string passed through the lifedome completely, the *Northern* would die at last, as surely as a body severed from its head . . .

Morrow, immersed in his own pain, wanted to close his eyes, succumb to the oblivion of unconsciousness. Was this how it was to end, after a thousand years?

But the quality of the noise above him - the rush of air, the screams - seemed to change.

He stared up.

The string, still cutting easily through the structure, had slowed to a halt.

'Mark,' Louise hissed. 'What's happening?'

The string had cut a full quarter-mile into the lifedome. For a moment the blue-glowing string hovered, like a scalpel embedded in flesh.

Then the Virtual display came to life once more. The electric-blue string executed a tight curve and sliced its way back out of the lifedome, exiting perhaps a quarter-mile above its entry point.

Louise wished there was a god, to offer up her thanks.

‘It’s done a lot more damage on the way out - but we are left with an intact lifedome,’ Mark said. ‘The ‘bots and autonomic systems are sealing up the breaches in the hull.’ He looked up at Louise. ‘I think we’ve made it.’

Louise, floating above her bed, hugged her knees against her chest. ‘But I don’t understand *how*, Mark.’

‘Spinner-of-Rope saved us,’ Mark said simply. ‘She opened up the discontinuity-drive and took us away from there at half lightspeed - and in just the right direction. See?’ Mark pointed. ‘She pulled the ship backwards, and away from the string.’

She looked into his familiar, tired eyes, and wished she could hug him to her. ‘It was Spinner-of-Rope. You’re right. It must have been. But the voice link to Spinner was one of the first things we lost. And we certainly didn’t have time to work up routines for the waldoes.’

‘In fact, we’re *still* out of touch with Spinner,’ Mark said.

‘So how did she know?’ Louise studied the scarred Virtual lifedome. ‘The trajectory she chose to get us out of this was almost perfect, Mark. *How did she know? ’*

Spinner-of-Rope buried her faceplate in her gloves; within her environment suit she trembled, uncontrollably.

It’s over, Spinner. You did well. It’s time to look ahead.

‘No,’ she said. ‘The string hit the ship. The deaths, the injuries—’

Don’t dwell on it. You did all you could.

‘Really? And did *you,* Michael Poole?’ she spat.

What do you mean?

‘Couldn’t you have helped us more? Couldn’t you have *warned* us that the thing was coming?’

He laughed, softly and sadly. *I’m sorry, Spinner. I’m not superhuman. I didn’t have any more warning than your people. I’m pretty much bound by the laws of physics, just as you are . . .*

She dropped her hands and thumped the side of the couch. There was still no link - voice or data - to Louise, and the rest of the crew. She was

isolated out here - stuck in the pilot's cage of an alien ship, with only a five-million-year-old ghost for company.

She felt a swelling of laughter, inside her chest; she bit it back.

Spinner-of-Rope?

'I'm scared, Michael Poole. I'm even scared of you.'

I don't blame you. I'm *scared of me.*

'I don't know what to do. What if Louise can't get back in touch?'

He was silent for a moment. Then:

Look, Spinner, your people can't stay here. In this timeframe, I mean.

'Why not?'

Because there's nothing for you here. The Ring - which you came to find - is ruined. This rubble of string fragments can't offer you anything.

'Then what?'

You have to move on, Spinner. You have to take your people to where they can find shelter and escape. His hands, warm and firm, closed invisibly over hers once more. *I'll show you. Will you trust me?*

'Where are we going?'

In search of the Ring.

'But - but the Ring is here. And it's destroyed. You said so yourself.'

Yes, he said patiently. *But it wasn't always so . . .*

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30

The ‘bot rolled fussily across the floor, its fat wheels crunching over the dust it had brought in from the surface of the neutron star planet. It held a bundle of sensors out before it on a flexible arm. Light, brilliant white, glared from the sensor arm. The way the ‘bot held out its sensor pack was rather prissy, Lieserl thought, as if the ‘bot didn’t quite approve of what it was being forced to inspect in here.

The ‘bot rolled up to one of the four chairs and sniffed at it cautiously.

‘There’s exotic matter here,’ Mark said suddenly.

‘What?’

‘The ‘bot has found exotic matter,’ Mark repeated evenly. ‘Somewhere inside the building.’

Uvarov growled from the pod, ‘But we’ve seen no evidence of wormhole construction here. And that structure is too small to house a wormhole Interface.’

‘I’m just reporting what the ‘bot’s telling me,’ Mark snapped, letting his irritation show. ‘Maybe we should gather a few more facts before wasting our time speculating, Uvarov.’

The ‘bot was still lingering close to one of the chairs - the second from the left of the row of four, Lieserl noted irrelevantly. As she watched, the ‘bot extended more arms, unfolded more packages of sensor equipment; it loomed over the chair menacingly, like some mechanical spider.

Mark walked up to the ‘bot, his face expressionless. ‘It’s somewhere inside the chair. The exoticity . . .’

‘*Inside the chair*?’ Lieserl felt like laughing, almost hysterically. ‘What happened, did someone drop exotic matter down behind the cushion while watching a Virtual show?’

He glared at her. ‘Come on, Lieserl. There is a construct of exotic matter embedded in this chair. It’s tiny - only a few fractions of an inch across - but it’s there.’ He turned to the ‘bot. ‘Maybe we can cook up some kind of magnified Virtual image . . .’

Pixels swirled before Lieserl’s face, brushing her cheeks intangibly; she stepped back.

The pixels coalesced into a crude sketch, suspended in the air. It looked like a jewel - clear, complete and seamless - hanging before her. There were

hints of further structure inside, not yet resolved by the ‘bot’s imaging systems.

She recognized the form.

‘*Lethe*. Another tetrahedron,’ she said.

‘Yes. Another tetrahedron . . . The form seems to have become a badge of humanity, doesn’t it? But this one is barely a sixteenth of an inch across.’

Pixels of all colours hailed through the interior of the little tetrahedron, as if scrambling for coherence. Lieserl caught elusive, tantalizing hints of structure. At one point it seemed that she could see another, smaller tetrahedron forming, nested inside the first - just as this construct was nested inside the tetrahedral form of the base as a whole. She wondered if the whole of this structure was like a Russian doll, with a series of tetrahedra snuggled neatly inside each other . . .

The magnified image was rather pleasing, she thought. It reminded her of the toy she’d had during her lightning-brief childhood: a tiny village immersed in a globe of water, with frozen people and plastic snowflakes . . . Thinking that, she felt a brief, incongruous pang of regret that her childhood, even as unsatisfactory as it had been, was now so *remote*.

‘Well, my exotic matter grain is in there somewhere,’ Mark said. ‘But the ‘bot is having trouble getting any further resolution.’ He looked confused. ‘Lieserl, there’s something very strange inside that little tetrahedral box.’

She kept her face expressionless; at times it was quite convenient to be a Virtual - it gave her such control. *Strange. Right. But what could be stranger than to be here: on the planet of a neutron star hurtling at lightspeed across the battlefield at the end of time? What can make things stranger than that?*

‘There’s a droplet of neutron superfluid in there,’ Mark said. He peered into the formless interior of the tetrahedron, as if by sheer willpower he might force it to give up its secrets. ‘Highly dense, at enormous temperatures and pressures . . . Lieserl, the tetrahedron contains matter at conditions you’d expect to find deep in the interior of a neutron star - in a region beneath the solid crust, called the mantle. That’s what the ‘bot is trying to see into.’

Lieserl stared at the swirling mists inside the tetrahedron. She knew that a neutron star had the mass of a normal star, but compressed into a globe

only a few miles in diameter. The matter was so dense that electrons and protons were forced together into neutrons; this superfluid of neutrons was a hundred billion *billion* times as dense as water.

'If that's so, how are the pressures contained? This construct is like a bomb, waiting to go off.'

He shook his head. 'Well, it looks as if the people who built this place found a way. And the construct may have been stable for a long time - millions of years, perhaps. You know, I wish we had more time to spend here. We don't even know how old this base is - from how many years beyond our time this technology dates.'

'But *why* construct such a thing?' She stared into the tetrahedron. '*Why* fill a little box with reconstructed neutron star material? Mark, do you think this was some kind of laboratory, for studying neutron star conditions?'

Uvarov's ruined voice brayed laughter into her ears. 'A laboratory? My dear woman, this is a war zone; I think basic science was unlikely to be on the agenda for the men and women who built this base. Besides, this neutron star is hardly typical. The people who came here placed discontinuity-drive engines at the star's pole, and drove it across space at close to lightspeed. Now, what research purpose do you think *that* served?'

Mark ignored him. He squatted down on his haunches before the image and peered up at it; the glow of the shifting pixels inside the tetrahedron cast highlights from his face and environment suit. 'I don't think the stuff in there was reconstructed, Lieserl.'

'What do you mean?'

'Think about it.' He pointed at the image. 'We know there is exotic matter in there . . . and as far as we know the primary purpose of exotic matter is the construction of spacetime wormholes. I think there's a wormhole Interface in there, Lieserl.'

She frowned. 'Wormhole mouths are hundreds of yards - or miles - across.' He straightened up. 'That's true of the Interfaces *we* can construct. Who knows what will be possible in the future? Or rather—'

'We know what you mean,' Uvarov snapped from the pod.

'Let's suppose there *is* a wormhole mouth inside this tiny construct,' Mark said. 'A wormhole so fine it's just a thread . . . but it leads across space, to the interior of the neutron star. Lieserl, I think the neutron

superfluid in here isn't some human reconstruction - I think it's a sample of material *taken from the neutron star itself*.'

Lieserl, involuntarily, glanced around the chamber, as if she might see the miniature wormhole threading across space, a shining trail connecting this bland, human environment with the impossibly hostile heart of a neutron star.

'But *why*?'

'Isn't it obvious?' Uvarov snapped.

Mark was smiling at her; evidently he had worked it out too. She felt slow, stupid, unimaginative. 'Just tell me,' she said dully.

Mark said, 'Lieserl, the link is there so the humans who built this base could reach the interior of the neutron star. I think they downloaded equipment into there: nanomachines, 'bots of some kind - maybe even some analogue of humans.

'They populated the neutron star, Lieserl.'

Uvarov rumbled assent. 'More than that,' he rasped. 'They *engineered* the damn thing.'

Closed timelike curves, Spinner-of-Rope.

The nightfighter arced through the muddled, relativity-distorted sky; the neutron star system wheeled around Spinner like some gaudy light display. Behind her, the huge wings of the Xeelee nightfighter beat at space, so vigorously Spinner almost imagined she could hear the rustle of immense, impossible feathers.

She felt her small fingers tremble inside gloves that suddenly seemed much too big for her. But Michael Poole's hands rested over hers, large, warm.

The ship surged forward.

We are going to build closed timelike curves . . .

Ignoring the protests of her tired back, Louise straightened up and pushed herself away from the Deck surface. She launched into the air, the muscles of her legs aching, and she let air resistance slow her to a halt a few feet above the Deck.

Once this had been a park, near the heart of Deck Two. Now, the park had become the bottom layer of an improvised, three-dimensional hospital, and the long grass was invisible beneath a layer of bodies, bandaging, medical supplies. A rough rectangular array of ropes had been set up,

stretching upwards from the Deck surface through thirty feet. Patients were being lodged loosely inside the array; they looked like specks of blood and dirt inside some huge honeycomb of air, Louise thought.

A short distance away a group of bodies - unmoving, wrapped in sheets - had been gathered together in the air and tethered roughly to the frame of what had once been a greenhouse.

Lieserl approached Louise tentatively. She reached out, as if she wanted to hold Louise's hand. 'You should rest,' she said.

Louise shook her head angrily. 'No time for that.' She took a deep breath, but her lungs quickly filled up with the hospital's stench of blood and urine. She coughed, and ran an arm across her forehead, aware that it must be leaving a trail there of blood and sweat. 'Damn it. Damn *all* of this.'

'Come on, Louise. You're doing your best.'

'No. That isn't good enough. Not any more. I should have designed for this scenario, for a catastrophic failure of the lifedome. Lieserl, we're overwhelmed. We've converted *all* the AS treatment bays into casualty treatment centres, and we're *still* overrun. Look at this so-called hospital we've had to improvise. It's like something out of the Dark Ages.'

'Louise, there's nothing you could have done. We just didn't have the resources to cope with this.'

'But we *should* have. Lieserl, the doctors and 'bots are operating triage here. *Triage,* on my starship.'

. . . And it didn't help that I diverted most of our supply of medical nanobots to the hull . . . Instead of working here with the people - crawling through shattered bodies, repairing broken blood vessels, fighting to keep bacterial infection contained within torn abdominal cavities - the nanobots had been press-ganged, roughly - and on *her* decision - into crawling over the crude patches applied hurriedly to the breached hull, trying inexpertly to knit the torn metal into a seamless whole once more.

She clenched her hands into fists, digging her nails into her palms. 'What if the Xeelee are studying us now? What will they think of us? I've brought these people across a hundred and fifty million light-years - and five million years - only to let them die like animals . . .'

Lieserl faced her squarely, her small, solid fists on her hips; lines clustered around her wide mouth as she glared at Louise. 'That's

sentimental garbage,' she snapped. 'I'm surprised at you, Louise Ye Armonk. Listen to me: what is at issue here is not *how you feel*. You are trying to survive - to find a way to permit the race to survive.'

Lieserl's stern, lined face, with the strong nose and deep eyes, reminded Louise suddenly of an overbearing mother. She snapped back, 'What do you know of how I feel? I'm a human, damn it. Not a - a—'

'An AI?' Lieserl met her gaze evenly.

'Oh, Lethe, Lieserl. I'm sorry.'

'It's all right, Louise. You're quite right. I am an artifact. I have many inhuman attributes.' She smiled. 'For instance, at this moment I have *two* foci of consciousness, functioning independently: one here, and one down on the planet. But . . .' She sighed. 'I *was* once human, Louise. If briefly. So I do understand.'

'I know, Lieserl. I'm sorry.' Louise had never found it easy to express affection. With a struggle, she said: 'In fact, you're one of the most *human* people I've ever met.'

Lieserl looked around at the makeshift hospital, following the soft cries of the wounded. 'Louise,' she said slowly, 'I have a long perspective. Think of the story of the race. Our timelines emerged from the oceans, and for millions of years circled the Sun with Earth. Then, in a brief, spectacular explosion of causality, the timelines erupted in wild scribbles, across the Universe. Humanity was everywhere.

'But now, our possibilities have reduced.

'Louise, all the potential paths of the race - all the timelines, running from those ancient oceans of the past, through millions of years to an unknown future - *all* of them have narrowed to a single event in spacetime: *here*, on this ship, *now*. And that event is under *your* control.'

Lieserl's face loomed before Louise now, filling her vision; Louise looked into her soft, vulnerable eyes, and - for the first time, really - she had a sudden, deep insight into Lieserl's personality. *This woman really is ancient - ancient, and wise.*

'Louise, you are not a woman - or rather, you are *more* than a woman. You are a survival mechanism: the best to be found, for this crucial instant, by our genes, and our culture, and our minds. If you didn't have the strength within you now, to deliver us through this causal gateway to the future, you would not have been chosen. But you *do* have the strength to continue,'

Lieserl said. ‘*To find a way through*. Look within yourself, Louise. Tap into that strength . . .’

There was a deep, almost subsonic groan, all around Louise. It sounded like thunder, she thought.

It was the sound of metal, under immense stress.

She pulled away from Lieserl and twisted in the air. She looked across at the section of hull breached by the arc of string. The patch that had been applied across the string damage gleamed brightly, fresh and polished, at the centre of the grass-coated hull surface. A stress failure - another breach of the lifedome - would kill them all. But the patch *looked* as if it was holding up okay . . . not that a visual inspection from this distance meant anything.

As if on cue, a projection of Mark’s head materialized before her. ‘Louise, I’m sorry.’

‘What is it?’

‘Come with me. We need to talk.’

‘No,’ she said. Suddenly, she felt enormously weary. ‘No more talk, Mark. I’ve done enough damage already.’

Behind her, Lieserl said warningly: ‘Louise . . .’

‘I heard what you said, Lieserl.’ Louise smiled. ‘But it’s all a little too mystical for a tired old engineer like me. I’m going to stay here. Help out in the hospital.’

Lieserl frowned at her. ‘Louise, you’re an engineer, not a doctor. Frankly, I wouldn’t want you treating *me*.’

Mark smiled. ‘Besides, we don’t have time for all this self-pity, Louise. This is *important*.’

She sighed. ‘What is?’

He whispered, in a surprisingly unrealistic hiss, ‘Didn’t you hear the hull stress noise? Spinner is moving the ship again.’

Think of spacetime as a matrix, Michael Poole whispered. *A four-dimensional grid, labelled by distance and duration. There are* events: *points in time and space, at nodes of the grid. These are the incidents that mark out our lives. And, connecting the events, there are* trajectories.

The starbow across the sky broadened, now. That meant her speed had reduced, since the relativistic distortion was lessened. Spinner called up a

faceplate display subvocally. Yes: the ship's velocity had fallen to a fraction over half lightspeed.

Trajectories are paths through spacetime, Poole said. *There are* timelike *trajectories, and there are* spacelike *trajectories. A ship going slower than light follows a timelike path. And, Spinner, we - all humans, since the beginning of history - work our snail-like way along timelike trajectories into the future. At last, our world-lines will terminate at a place called* timelike infinity - *at the infinitely remote, true end of time.*

But 'spacelike' means moving faster than light. A tachyon - a faster-than-light particle - follows a spacelike path, as does this nightfighter under hyperdrive.

She twisted in her seat. Already the neutron star system had vanished, into the red-shift distance. And directly ahead of her there was a cloud of cosmic string; space looked as if it were criss-crossed by fractures, around which blue-shifted star images slid like oil drops.

Poole's hands, invisible, tightened around hers as the ship threw itself into the cloud of string.

We know at least three ways to follow spacelike paths, Spinner-of-Rope: three ways to travel faster than light. We can use the Xeelee hyperdrive, of course. Or we can use spacetime wormholes. Or, Poole said slowly, *we can use the conical spacetime around a length of cosmic string . . .*

Think of the gravitational lensing effect that produces double images of stars around strings. A photon coming around one side of the string can take tens of thousands of years longer to reach our telescopes than a photon following a path on the other side of the string.

So, by passing through the string's conical deficit, we could actually outrun a beam of light . . . There was string all around the ship, now, tangled, complex, an array of it receding to infinity. A pair of string lengths, so twisted around each other they were almost braided, swept over her head. She looked up. The strings trailed dazzling highways of refracting star images.

Behind her the huge wings spread wide, exultant.

This damn nightfighter was made for this, she thought.

Under Poole's guidance, Spinner brought the craft to a dead halt; the discontinuity wings cupped as they tore at space. Then Spinner turned the craft around rapidly - impossibly rapidly - and sent it hurtling at the string

pair once more. The nightfighter soared upwards, and this time the two strings passed *underneath* the ship's bow.

. . . And if you can move along spacelike paths, Spinner-of-Rope, you can construct closed timelike curves.

The neutron star system was *old.*

Once the system had been a spectacular binary pair, adorning some galaxy lost in the sky. Then one of the stars had suffered a supernova explosion, briefly and gloriously outshining its parent galaxy. The explosion had destroyed any planets, and damaged the companion star. After that, the remnant neutron star slowly cooled, glitching as it spun like some giant stirring in its sleep, while its companion star shed its life-blood hydrogen fuel over the neutron star's wizened flesh. Slowly, too, the ring of lost gas formed, and the system's strange, spectral second system of planets coalesced.

Then human beings had come here.

The humans soared about the system, surveying. They settled on the largest planet in the smoke ring. They threw microscopic wormhole mouths into the cooling corpse of the neutron star, and down through the wormholes they poured devices and - perhaps - human-analogues, made robust enough to survive in the neutron star's impossibly rigorous environment.

The devices and human-analogues had been *tiny*, like finely jewelled toys.

The human-analogues and their devices swarmed to a magnetic pole of the neutron star, and great machines were erected there: discontinuity-drives, perhaps powered by the immense energy reserves of the neutron star itself.

Slowly at first, then with increasing acceleration, the neutron star - dragging its attendant companion, ring and planets with it - was forced out of its parent galaxy and thrown across space, a bullet of stellar mass fired at almost lightspeed.

'A bullet. Yes.' In the pod, Uvarov mused. 'An apt term.'

Lieserl stared at the swirling, unresolved pixels inside the Virtual image's clear tetrahedral frame. 'I wonder if there are still people in there,' she said.

Mark frowned. 'Where?'

‘People-analogues. Inside the neutron star. I wonder if they’ve survived.’

He shrugged, evidently indifferent. ‘I doubt it. Unless they were needed for maintenance, they would surely have been shut down after their function was concluded.’

Shut down . . . But these were *people*. What if they *hadn’t* been ‘shut down’? Lieserl closed her eyes and tried to imagine. How would it be, to live her life as a tiny, fish-like creature less than a hair’s-breadth tall, living inside the flux-ridden mantle of a neutron star? What would her *world* be like?

‘A bullet,’ Uvarov said again. ‘And a bullet, fired by our forebears - *directly at the heart of this Xeelee construct*.’

She opened her eyes.

Mark was frowning. ‘What are you talking about, Uvarov?’

‘Can’t you see it yet? Mark, what do you *imagine* the purpose of this great engineering spectacle was? We already know - from the Paradoxa data, and the fragments provided to us by Lieserl - that the rivalry between humanity and Xeelee persisted for millions of years. More than persisted - it *grew* in that time, becoming an obsession which - in the end - consumed mankind.’

Lieserl said, ‘Are you saying that all of this - the discontinuity engines, the hurling of the neutron star across space - all of this was intended as an assault on the Xeelee?’

‘But that’s insane,’ Mark said.

‘Of course it is,’ Uvarov said lightly. ‘My dear friends, we’ve plenty of evidence that humanity isn’t a particularly intelligent species - not compared to its great rivals the Xeelee, at any rate. And I have never believed that humanity, collectively, is entirely *sane* either.’

‘You should know, Doctor,’ Mark growled.

‘I don’t understand,’ Lieserl said. ‘Humans must have known about the photino birds - damn it, *I* told them! They must have seen what danger the birds represented to the future of all baryonic species. And they must have seen that the Xeelee - if remote and incomprehensible - were at least baryonic too. So the goals of the Xeelee, if directed against the birds, had to be in the long-term interests of mankind.’

Uvarov laughed at her. ‘I’m afraid you’re still looking for rational explanations for irrational behaviour, my dear. Lieserl, I believe that the Xeelee grew into the position in human souls once occupied by images of gods and demons. But here, at last, was a god who was finite - who occupied the same mortal realm as humans. A god who could be *attacked*. And attack we did: down through the long ages, while the stars went out around us, all but ignored.’

‘And so,’ Mark said grimly, ‘we fired off a neutron star at the Ring.’

‘A spectacular gesture,’ Uvarov said. ‘Perhaps humanity’s greatest engineering feat . . . But, ultimately, futile. For how could a mere neutron star disrupt a loop of cosmic string? And besides, the Xeelee starbreaker technology was surely sufficient to destroy the star before—’

‘But it didn’t work,’ Lieserl said slowly.

Mark had been staring at the sensor ‘bot; the squat machine had come to a halt before the chair, its sensor arms suspended in the air. ‘What do you mean?’

‘Think about it,’ she said. ‘The neutron star is heading *away* from the site of the Ring. And it’s clearly not been disrupted by starbreakers.’

‘Yes. So something went wrong,’ Uvarov said. ‘Well, the precise sequence hardly matters, Lieserl. And—’

It happened in a heartbeat.

The light died. The ancient structure was flooded with darkness.

Louise and Mark left the improvised hospital and found an abandoned house. The house was bereft of furniture, its owners gone to live in the zero-gee sky (but, of course, the zero-gee dwellings were gone now, Louise noted morosely, swept out of the sky by the cosmic string incursion).

Mark quickly created a Virtual diagram in the air: a geometrical sketch of lines and angles, lettered and arrowed.

Louise couldn’t help but smile. ‘Lethe, Mark. At a time like this, you give me a diagram Euclid would have recognized.’

He looked at her seriously. ‘Louise, working out the spacetime geometry of a cosmic string is a hard problem in general relativity. But, given that geometry, all the rest of it is no more than Pythagoras’ theorem . . .

‘As near as I can figure out, this is what Spinner is up to.’ There was a pair of tubes in the air, glowing electric blue, like neon. ‘We are flying

around a pair of cosmic strings. Now, here are the angle deficits of the strings' conical spacetimes.' Wedges of air, like long cheese slices, were illuminated pale blue; one wedge trailed each string length.

'Okay. Here comes the *Northern*.' The ship was represented by a cartoon sketch of a sycamore seed in black. 'You can see we're travelling on a curving path around the string pair, going against the strings' own rotation.'

Now the seed arced into the wedge-shaped angle deficit glow of one of the strings. As soon as it had entered the boundary it vanished, to reappear instantly at the far side of the deficit.

Mark snapped his fingers. 'See that? Faster-than-light travel: a spacelike trajectory right across the deficit.'

Now the little ship-model came arcing back and flickered through the second string's angle deficit. 'Louise, the strings are travelling just under the speed of light - within three decimal places of it, actually. Spinner has the *Northern* travelling at a little over half lightspeed. The turning curves, and the accelerations, are incredible . . . The domain wall inertial shielding seems to be working pretty well, although there's a little leakage.'

Louise nodded. 'Right. Which is why the *Northern* is complaining.'

'Yeah. Louise, the *Northern* wasn't designed for this - and neither was our bastardized lash-up of *Northern* and nightfighter. But there's nothing we can do. We'll just have to pray the whole mess holds together until Spinner-of-Rope finishes her joy-riding . . .

'Anyway, the trajectory she's following is quite precisely machined . . . We're passing from side to side of the string pair in light-minutes, but we're crossing light-years thanks to the spacelike savings. Louise, I think Spinner-of-Rope is assembling closed timelike curves, from these spacelike trajectories.'

Louise stared at the seed-craft; she felt an impulse to reach out and pluck it from the air. 'But why, Mark? And *how*?'

'I *know* what a closed timelike curve is,' Spinner said. Again she dragged the ship to a halt and whirled its nose around towards the string; although she was still shielded from the impossible accelerations she felt herself gasp as the Universe lurched around her. 'The original mission of the *Great Northern*, with its wormhole, was to follow a segment of a closed timelike curve . . .'

Yes. A closed timelike curve is a circle in time. By following a closed timelike curve all the way to its starting point, you would at last meet yourself, Spinner-of-Rope . . . Closed timelike curves allow you to travel through time, and into the past.

Again the nightfighter hurled itself at the cosmic string pair; again Spinner hauled at the waldoes, dragging the ship around. The huge wings beat at spacetime.

She screamed, 'How much longer, damn it?'

Spinner, each traverse around the string pair is taking us a thousand years into the past. But we need to travel back through a hundred millennia, or more . . .

'A hundred traverses,' she whispered.

Can you do it, Spinner? Do you have the strength?

'No,' she said. 'But I don't think I have much choice, do I?'

Lieserl looked around the darkened chamber, confused. The 'bot's brilliant lantern had been extinguished. Suddenly the walls were dim grey sheets, closing over her head, claustrophobic.

'Lieserl.' Mark's face loomed before her, erupting out of the darkness; his blue eyes, white teeth where vivid. He moved with nanosecond speed, the slowness of humanity finally abandoned.

Dimly, she was aware of poor Uvarov sitting in the pod. He was frozen in human-time, and unable to follow their high-speed insect-buzz. 'What is it? What's happened?'

'The 'bot has failed. Lieserl, it was controlled by the ship's processors. The download link from the ship must have gone down . . .'

Immediately, she *felt* that loss of processor support. She felt as if her mind had been plunged into a twilight cavern, echoing; she felt *herself* drift away.

'They've abandoned us.'

'Probably they had no choice, Lieserl.'

I am to experience death, then. But - so suddenly?

Lieserl would survive, of course - as would Mark, as projections on board the *Northern*. But this projection - *she*, this unique branch of her ancient consciousness - couldn't be sustained solely by the limited processors on the pod.

She felt a spasm of regret that she would never be able to tell Louise and Spinner-of-Rope about the wonderful little people embedded inside the neutron star flux.

She reached for Mark. Their environment suits melted away; desperately they pressed their bodies against each other. With deep, savage longing, she sought Mark's warm mouth with her lips, and—

'Lethe. And we can't even *talk* to her.' Louise looked out of the house and across the lifedome, in the vague direction of the nightfighter cage. 'Mark, Spinner is a smart woman, but she's no expert on string dynamics. And she's out there without significant processor support. I don't see how she's even calculating the trajectories we're following.'

Mark frowned. 'I - wait.' He held up a hand, and his expression turned inward, becoming blank.

'What is it?'

'We've stopped. I mean, the traverses around the string pair have been halted.' He thought for a moment. 'Louise, I counted a hundred and seven complete circuits . . .'

'Louise? Mark?'

The voice sounded out of the air close to Louise's ear. 'Yes, Trapper-of-Frogs. I hear you. Where are you?'

'I'm in the forest. I—'

'Yes?'

'I think you'd better get up here.'

Louise looked at Mark; he was frowning, and no doubt some sub-projection of him was already with Trapper.

'Why?' Louise asked. 'What's wrong, Trapper?'

'Nothing's wrong. Not exactly. It's just - *different* . . .'

Michael. Poole's invisible ghost-touch evaporated. Spinner-of-Rope lifted her hands from the waldoes.

Her job was done, then. She pulled her fingers inside the body of her gloves and balled her stiff hands into fists, digging her nails into the palms of her hands. She felt herself shudder, from fear and exhaustion. There was a stabbing in the small of her back, and across her shoulder blades, just below her neck; she twisted in her couch and flexed her spine, trying to work out the stiffness.

Then she looked out, beyond the construction-material cage, for the first time.

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31

‘**D**r Uvarov. Dr Garry Uvarov.’

The voice, flat and mechanical, roused him from a broken sleep.

He opened his mouth to reply, and ropy saliva looped across his lips. ‘What is it now?’

‘Is there anything you require?’ The voice, generated by the pod’s limited processors, didn’t even bear a semblance of humanity, and it came - maddeningly! - from all around him.

‘Yes,’ he said. He felt himself shivering, distantly; he felt *cold*. Was the power in here failing already?

How long had it been, since his abrupt abandonment by Lieserl and Mark Wu?

‘Yes,’ he told the pod again. ‘Yes, there is something I require. Take me back to the *Northern*.’

The pod paused, for long seconds.

Uvarov felt the cold settle over his bones. Was this how he was to die, suspended in the thoughts of an idiot mechanical? Was he to suffer a final betrayal at the hands of technology, just as the AS nanobots had been slowly killing him for years?

Well, if he was to die, he would take with him one deep and intense regret: that he had not lived to see the conclusion of his grand design, his experiment at extending the natural longevity of his race. He knew how others had seen him: as *obsessed* with his eugenics objectives, as a monomaniac perhaps. But - ah! What an achievement it would have been! What a monument . . .

Ambition burned within him still, intense, almost all-consuming, betrayed by the failure of his body.

His thoughts softened, and he felt himself grow more diffuse, his awareness drifting off into the warm, comfortable caverns of his memory.

The pod spoke again. ‘I’m unable to comply with your request, Doctor. I can’t obtain a fix on the *Northern*. I’m sorry. Would you like me to—’

‘Then kill me.’ He twisted his head from side to side, relishing the stabs of pain in his neck. ‘I’m stranded here. I’m going to die, as soon as my supplies run out. Kill me now. Turn off the damn power.’

‘I can’t comply with that, either, Dr Uvarov.’

But Uvarov was no longer listening. Once more he felt himself falling into a troubled - perhaps final - sleep, and his ruined lips moved slowly.

‘*Kill me, you damn mechanical . . .*’

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32

The torus of ragged, fragmented string loops was gone. Now, cosmic string crossed the cavity: great, wild, triumphant whorls of it, shining a false electric blue in the skydome's imager.

This one, tremendous, complex, multiple loop of string filled the cavity at the bottom of the gravity well. This was - astonishingly, unbearably - a single object, an *artifact*, at least ten million light-years across.

Louise Ye Armonk - with Mark, Lieserl and Morrow - hovered on zero-gee scooters, suspended beneath the crown of the skydome. Beneath Louise - she was distantly aware - the layers of forest were filled with the rich, comforting noises: the calls of birds and monkeys and the soft burps of frogs, sounds of busy life which persisted even here at the end of time . . .

Beyond the clear dome, string filled the Universe.

Here, a hundred thousand years into the past, the galaxies still fell, fragmenting and blue-shifted, into the deepest gravity well in the Universe. And the *Northern* had emerged from its jaunts through the string loop's spacetime defects to find itself once more inside a star-walled cavity, at the bottom of this Universal well.

There the similarity ended, though, Louise thought. The cavity walls were much *smoother* than in the future, containing rather fewer of the ragged holes she'd noted . . . The walls looked almost *artificially* smooth here, she thought uneasily.

And, of course, there was the *Ring*, whole and magnificent.

The Ring was a hoop woven from a billion-light-year length of cosmic string. The *Northern* was positioned somewhere above the plane of the Ring. The near side of the artifact formed a tangled, impenetrable fence over the lifedome, twisted exuberantly into arcs and cusps, with shards of galaxy images glittering through the morass of spacetime defects. And the far side of the object was visible as a pale, hard band, remote across the blue-shifted sky.

The rough disc of space enclosed by the Ring - a disc no less than ten million light-years across, Louise reminded herself - seemed virtually empty. Perhaps, she mused, in this era the Xeelee were actively working to keep that central region clear.

. . . Clear, Louise saw as she looked more carefully, save for a single, glowing point of light, right at the geometric centre of the Ring. She saw how Lieserl was staring into that point of light, her mouth half-open.

Spinner-of-Rope's precipitate action had delivered them, back through time, to another snapshot-timeslice of this war in Heaven . . . and this was, it seemed, an era not far removed from the Ring's final fall.

She was aware of their eyes - Mark's, Lieserl's, Morrow's - resting on her, expectantly. On *her.*

Remember what Lieserl said, she told herself. *I'm a survival mechanism. That's all. I have to keep functioning, for just a little while longer* . . . She reached deep inside her.

She clapped her hands. 'All right, people - Mark, Lieserl. Let's do some work. I think it's obvious we've delivered ourselves right into the middle of a war zone. We know that, at this moment, the photino birds must be hitting this Ring from all sides - because, within a hundred thousand years, we know that the Ring is going to be destroyed. That gives me the feeling that we don't have much time, before one side or other notices we're here . . .'

'I think you're right, Louise,' Mark said. Both the Virtuals, on high-capacity data links to the central processors, were working on different aspects of the situation. 'I don't think we should be fooled by the fact that most of the action in this incredible war seems to be occurring at sublight velocities, so that - on this scale - it has all the pace of an ant column crossing the Sahara. Let's not forget the Xeelee have a hyperdrive - which we've stolen - and, for all we know, so do the photino birds. We could be discovered at any time.'

'So give me a summary of the environment.'

Mark nodded. 'First of all, our position in *time*: Spinner-of-Rope constructed enough closed timelike paths for us to have travelled a hundred thousand years into the past, back from the era to which our first journey brought us.' He raised his face to the skydome and rose into the air by a few feet, absently forgetting to take his Virtual-scooter with him. 'The Ring is complete in this era, as far as we can tell. Its mass is immense - in fact we're suffering inertial drag from it. Kind of a lot of drag, in fact . . . We're being hauled around, through space, by the Ring. Spinner-of-Rope seems to be compensating . . .'

'Lieserl. Tell me what you have.'

Lieserl seemed to have to tear her eyes away from that tantalizing point of light at the heart of the Ring. She looked down at Louise.

‘I have *the Ring*, Louise. We have been restored to an era before its destruction. Bolder’s Ring is a single loop of cosmic string . . . but an immense one, no less than ten million light-years across and with the mass of tens of thousands of galaxies, united into one seamless whole. The string is twisted over on itself like wool wrapped around a skein; the Ring’s topography is made up of string arcs moving at close to lightspeed, and cusps which actually *reach* lightspeed. The motion is complex, but - as far as I can tell - it’s non-intersecting. The Ring could persist forever.

‘Louise, there is no way this monster could have formed naturally. Our best theories say that any natural string loops should be a mere thousand light-years across.’ She looked up, and the blue false colour of the string images caught her profile, picking out the lines around her eyes. ‘Somehow —’ she laughed briefly ‘—somehow the Xeelee found a way to drag cosmic string across space - or else to manufacture it on a truly heroic scale - and then to knit it up into this immense *artifact*.’

Louise stared up at the Ring, tracing the tangle of string around the sky, letting Lieserl’s statistics pour through her head. *And I might have died without seeing this. Thank you. Oh, thank you . . .*

‘The cosmology here is . . . spectacular,’ Lieserl said, smiling. ‘We have, essentially, an extremely massive torus, rotating very rapidly. And it’s *devastating* the structure of spacetime. The sheer mass of the Ring has generated a gravity well so deep that matter - *galaxies* - is being drawn in, towards this point, across hundreds of millions of light-years. Even our original Galaxy, the Galaxy of mankind, was drawn by the Ring’s mass. So we know that the Ring was indeed the “Great Attractor” identified by human astronomers.

‘And the *rotation* has significant effects. Louise, we’re on the fringe of a Kerr metric - the classic relativistic solution to the gravitational field of a rotating mass. In fact, this is what’s called a *maximal* Kerr metric: because the torus is spinning so fast the angular momentum far exceeds the mass, in gravitational units . . .

‘As Mark said, the Ring’s rotation is exerting a large torque on the ship. This is *inertial drag:* the twisting of spacetime around the rotating Ring.’

Morrow frowned. ‘Inertial drag?’

Lieserl said, ‘Morrow, naive ideas of gravity predicted that the *spin* of an object wouldn’t affect its gravitational field. No matter how fast a star rotated, you’d be attracted simply towards its centre, just as if it wasn’t rotating at all.

‘But relativity tells us that isn’t true. There are nonlinear terms in the equations which couple the rotating mass to the external field. In other words, a spinning object drags space around with it,’ she said. ‘*Inertial drag*. And that’s the torque the *Northern* is experiencing now.’

‘What else?’ Louise asked. ‘Mark?’

He nodded. ‘The first point is, we’re *drowning* in radio-wavelength photons—’

That was unexpected. ‘What are you talking about?’

‘I mean it,’ he said seriously, turning to face her. ‘That’s the single most significant difference in our gross physical environment, compared to the era we came from: we’re now immersed in a dense mush of radio waves.’ He looked absent for a moment. ‘And the intensity of it is increasing. There’s an *amplification* going on, slow, but significant on the timescales of this war; the doubling time is around a thousand years. Louise, none of this shows up in the future era. By then, the radio photons will be gone.’

Louise shook her head. ‘I can’t make sense of this. What’s causing the amplification?’

He shrugged, theatrically. ‘Beats me.’ He glanced around the sky. ‘But look around. The Ring is contained in a shell of galactic material, Louise. The frequencies of the radio waves are below the plasma frequency of the interstellar medium. So the waves are *trapped* in this galaxy-walled box. We’re inside an immense resonant cavity, ten million light-years across, with reflecting walls.’

Morrow looked beyond the skydome uncertainly. ‘Trapped? But what happens when—’

Lieserl cut in, ‘Mark, I think I’ve figured it out. The cause of the radio-wave amplification.’

He glanced at her. ‘What?’

‘It’s the inertial drag. We’re seeing superradiant scattering from the gravitational field. A photon, falling into the Ring’s gravity well, is coupled to the Ring by the inertial drag, and is then thrown out with additional energy—’

‘*Ah*. Right.’ Mark nodded, looking distant. ‘That would give an amplification of a few tenths of one per cent each traverse . . . just about fitting my observations.’

Morrow frowned. ‘Did I understand that? It sounds as if the photons are doing gravitational slingshots around this Ring.’

Louise smiled at him, sensing his fear. ‘That’s right. The inertial drag is letting each photon extract a little energy from the Ring; the radiation is amplified, and the Ring is left spinning just a fraction slower . . .

‘Lieserl. Tell us more about the spacetime metric.’ She looked up, at the point of light at the heart of the Ring. ‘What do we see, there, at the centre?’

Lieserl looked up, her face composed. ‘I think you know, Louise. It is a *singularity*, at the centre of the Ring itself. The singularity is hoop-shaped, a circular flaw in space: a rip, caused by the rotation of the immense mass of the Ring. The singularity is about three hundred light-years across - obviously a lot smaller than the diameter of the material Ring . . .

‘If the Ring were spinning more slowly, the Kerr metric would be quite well-behaved. The singularity would be cloaked in *two* event horizons - one-way membranes into the centre - and, beyond them, by an *ergosphere:* a region in which the inertial drag is so strong that *nothing* sublight can resist it. If we were in an ergosphere, we’d have no choice but to rotate with the Ring. In fact, if it weren’t rotating at all, the Kerr field would collapse into a simple, stationary black hole, with a point singularity, a single event horizon and no ergosphere.

‘But the Ring *is* spinning . . . and too rapidly to permit the formation of an event horizon, or an ergosphere. And so . . .’

Louise prompted, ‘Yes, Lieserl?’

‘And so, the singularity is *naked*.’

Michael Poole sat with his legs crossed comfortably on the shoulder of the nightfighter. His gaze was on Spinner’s face, steady, direct.

The Ring is a machine, whose sole purpose is to manufacture that naked singularity. Don’t you see? The Xeelee constructed this huge Ring and set it spinning in order to tear a hole in the Universe.

Spinner-of-Rope enhanced the false-colour of the central singularity in her faceplate imager. The flaw looked like a solid disc - a coin, perhaps - almost on edge towards her, but tipped slightly so that she could see its upper surface.

In that surface, white starlight swam. (*White?*)

She said to Poole, ‘The Xeelee built all of this - they modified history, disrupted spacetime, drew in galaxies to their destruction across hundreds of millions of light-years - just for *this*?’

Poole lifted his eyebrows. *It is the greatest baryonic artifact, Spinner-of-Rope. The greatest achievement of the Xeelee . . .*

The singularity was like a jewel, surrounded by the undisciplined string-scribble of the Ring itself.

‘It’s very beautiful,’ she conceded.

Poole smiled. *Ah, but its beauty lies in what it does . . .*

He turned his gaunt, tired face up to the singularity. *Spinner-of-Rope, humans have imputed many purposes to this artifact. But the Ring is not a fortress, or a last redoubt, or a battleship, or a base from which the Xeelee can reclaim their baryonic Universe*, he said sadly. *Spinner, the Xeelee know they have lost this war in Heaven. Perhaps they have always known that, even from the dawn of their history.*

‘I don’t understand.’

Spinner, the singularity is an escape hatch.

Lieserl and Mark turned to each other, inhumanly quickly. They stared into each other’s eyes, as if exchanging data by some means invisible to humans, their blank expressions like mirror images.

‘What is it?’ Louise asked. ‘What’s happened?’

Pixels, defects in the Virtual projection, crawled across Mark’s cheek. ‘We need Spinner-of-Rope,’ he snapped. ‘We can’t wait for the repairs to the data links. We’re trying to find bypasses - working quickly—’

Louise frowned. ‘Why?’

Mark turned to her, his face expressionless. ‘We’re in trouble, Louise. The cops are here.’

Spinner-of-Rope asked, ‘How do you *destroy* a loop of cosmic string ten million light-years across?’

It isn’t so difficult . . . if you have the resources of a universe, and a billion years, to play with, Spinner-of-Rope. Poole, perched on the shoulder of the nightfighter, pointed at a hail of infalling galaxies swamping a nearby section of the Ring. *If the Ring tangles - if cosmic string self-intersects - it cuts itself*, he said. *It intercommutes. And a new subloop is formed, budding*

off the old. And perhaps that subloop, too, will self-intersect, and split into still smaller loops . . . and so on.

Spinner nodded. ‘I think I understand. It would be an exponential process, once started. Pretty soon, the Ring would decay into the torus of debris we found - will find - a hundred thousand years from now . . .’

Yes. No doubt the motion of the Ring has been designed by the Xeelee so that it does not cut itself. But all one need do is start the process, by disrupting the Ring’s periodic behaviour. And that is evidently what the photino birds are endeavouring to do, by hurling galaxies - like thrown rocks - at the Ring.

Spinner sniffed. ‘Seems kind of a crude technique.’

Poole laughed. *Baryonic chauvinism, Spinner-of-Rope? Besides, the birds have other mechanisms. I—*

‘ . . . Spinner. *Spinner-of-Rope*. Can you hear me?’

Spinner sat bolt upright in her couch and clutched at her helmet. ‘Lieserl? Is that you?’

‘Listen to me. We don’t have much time.’

‘Oh, Lieserl, I was beginning to think I’d never—’

‘*Spinner*! Shut up, damn you, and *listen*.’

Spinner subsided. She’d never heard Lieserl use a tone like that before.

‘Use the waldoes, Spinner. You have to get us out of here. Take us straight up, with the hyperdrive, over the plane of the Ring. Have you got that? Use the longest jump distance you can find. We’ll try to patch subroutines into the waldoes, but—’

‘Lieserl, you’re scaring the pants off me. Can’t you tell me what’s wrong?’

‘No time, Spinner. Please. Just do it . . .’

The Universe *darkened*.

For a bleak, heart-stopping instant Spinner thought she was going blind. But the telltales on the waldoes still gleamed at her, as brightly as ever.

She looked up. There was something before the ship, occluding the blue-shifted galaxy fragments, hiding the Ring.

She saw night-dark wings, spread to their fullest extent, looming over the *Northern*.

Nightfighters.

She twisted in her seat. There were *hundreds* of them - impossibly many, dark lanterns hanging in the sky.

They were Xeelee. The *Northern* was surrounded.

Spinner screamed, and slammed her fists against the hyperdrive waldo.

The ‘fighters moved through electric-blue cosmic string like birds through the branches of a forest. There were so many of them in this era. They were cool and magnificent, their night-dark forms arrayed deep into space all around her. Lieserl stared at the swooping, gliding forms, willing herself to see them more clearly. Had any humans ever been closer to Xeelee than this?

The Xeelee moved in tight formation, like bird-flocks, or schools of fish; they executed sudden changes of direction, their domain wall wings beating, in squads spanning millions of miles - absolutely in unison. Now Lieserl saw how ‘fighters *should* be handled, in contrast to Spinner’s earnest, clumsy work. The nightfighters were sculptures of spacetime, with a sleek beauty that made her shiver: this was baryonic technology raised to perfection, to a supreme art, she thought.

She was struck by the contrast between this era and the age of devastation - of victory for the photino birds - to which the *Northern* had first brought them. Here, the Ring was complete and magnificent, and the Xeelee, in their pomp, filled space. Already, she knew, the final defeat was inevitable, and the Xeelee were, in truth, huddling inside their final retreat. But still, her heart beat harder inside her as she looked out over this, the supremacy of baryonic life.

The overlapping lengths of string slid down, smoothly, past the lifedome, as the *Northern* climbed. The nightfighters swooped like starlings through the string, and around the *Northern* - no, Spinner realized suddenly; the nightfighters were *flickering* across space.

‘They’re using their hyperdrive,’ she breathed.

Yes. Poole stared up at the nightfighters, his lined face translucent. *And we’re hyperdriving too. You’re pushing it, Spinner; we’ve never tried jumps of this scale, even in test. Do you know how fast you’re travelling? Ten thousand light-years with every jump . . . But even so, the Xeelee are easily keeping pace with us.*

Of course they are, Spinner thought. *They are Xeelee.*

These ‘fighters could have stopped the *Northern* at any time - even destroyed it. But they hadn’t.

Why not?

The ship was rising high above the plane of the Ring. The tangle of string fell away from the foreground, and she could see easily now the million-light-year curve of the structure’s limb. And at the heart of the Ring, the singularity seemed to be unfolding towards her, almost welcoming.

The Xeelee ‘fighters rose all around her, like leaves in a storm. *They can’t believe we’re a threat. I guess humans never were a threat, in truth. Now, it’s almost as if the Xeelee are escorting us*, she thought.

‘Lieserl,’ she said.

‘I hear you, Spinner-of-Rope.’

‘Tell me what in *Lethe’s* name we’re doing.’

‘You’re taking us out of the plane of the Ring . . .’

‘And then?’

‘*Down . . . ’* Lieserl hesitated. ‘Look, Spinner, we’ve got to get away from the Xeelee, before they change their mind about us. And we’ve nowhere else to run, not in all of the Universe.’

‘And this is your plan?’ Spinner was aware of the hysteria in her own voice; she felt fear spread through her stomach and chest, like a cold fluid. ‘*To fly into a singularity*?’

Mark punched his thigh. ‘I was right, damn it,’ he said. ‘I was right all along.’

The tension was a painful presence, clamped around Louise’s throat. ‘Damn it, Mark, be specific.’

He turned to her. ‘About the significance of the radio energy flux. Don’t you see? The photino birds have *manufactured* this immense cavity, of stars and smashed-up galaxies, to imprison the Ring.’ He glanced around the skydome. ‘Lethe. It must have taken them a billion years, but they’ve done it. They’ve built a huge mirror of star-stuff, all around the Ring. It’s a feat of cosmic engineering almost on a par with the construction of the Ring itself.’

‘A mirror?’

‘The interstellar medium is opaque to the radio energy. So each radio photon gets reflected back into the cavity. The photon orbits the Ring - and on each pass it’s superradiant-amplified, as Lieserl described, and so sucks

out a little more energy from the inertial drag of the Ring's rotation. And then the photon heads out again . . . *but it's still trapped by the galaxy mirror*. Back it goes again, to receive a little more amplification . . . Do you see? It's a classic example of positive feedback. The trapped radio modes will grow endlessly, leaching energy from the Ring itself . . .'

'But the modes can't grow indefinitely,' Morrow said.

'No,' Mark said. 'The process is an *inertial bomb*, Morrow. All that electromagnetic pressure will build up in the cavity, until it can no longer be contained. And in the end - probably only a few tens of millennia from now - it will blow the cavity apart.'

Louise glanced around the sky, seeing again the smooth distribution of galaxies she'd noted earlier. 'Right. And, in a hundred thousand years, the *Northern* will fly right into the middle of the debris from that huge explosion.'

Now the ship had sailed high above the plane of the Ring; Louise could see the whole structure, laid out before her like the rim of a glimmering mirror, with the sparkle of the singularity at its heart.

Lieserl said, 'Louise, the hostile photino bird activity we've noted before - the direct assault on the Ring itself with lumps of matter - is spectacular, but Mark's right: this radio bomb trick is what will truly bring down the Ring.' A subtle smile played on her lips. 'It's damn clever. The birds are draining the Ring itself, drawing energy out of the gravitational field using inertial drag. They're going to use the Ring's own mass-energy to wreck it.'

Subvocally, Louise checked her chronometer. Less than twenty minutes had elapsed since Mark and Lieserl had ordered Spinner to start moving the ship, but already they must have crossed eight million light-years - already they must be poised directly above the singularity.

'Mark. Where are we going?'

Poole, evidently trying to calm Spinner, told her what would happen to the nightfighter as it approached the disc singularity.

A timelike trajectory could reach the upper surface of the disc, Poole told her. A ship could reach the *plane* of the singularity. But - so said the equations of the Kerr metric - no timelike trajectory could pass *through* the singularity loop and emerge from the other side.

'So what happens? Will the ship be destroyed?'

No.

‘But if the ship can’t travel through the loop - where does it go?’

There can be no discontinuity in the metric, you see, Spinner-of-Rope. Poole hesitated. *Spinner-of-Rope, the singularity plane is a place where universes kiss.*

‘Lethe,’ Louise said. ‘You’re planning to take us *out of the Universe*?’

Mark swivelled his head towards her, unnaturally stiffly; the degradation of the image of his face - the crawling pixel-defects, the garish colour of his eyes - made him look utterly inhuman. ‘We’ve nowhere else to run, Louise. Unless you have a better idea . . .’

She stared up at the singularity. The AIs, working together at inhuman speed, had come up with a response to this scenario. *But are they right*? She felt the situation slipping away from her; she tried to *plan*, to come to terms with this.

Lieserl said dryly, ‘Of course, timing is going to be critical. Or we might end up in the wrong universe . . .’

Morrow clung to his scooter, his eyes wide, his knuckles bloodless. ‘What in Lethe’s name are you talking about now?’

Mark hesitated. ‘The configuration of the string is changing constantly. It’s a dynamic system. And that’s changing the topology of the Kerr metric - it’s changing the basis of the analytical continuation of space through the singularity plane . . .’

‘Damn you,’ Morrow said. ‘I wish you’d stick to English.’

‘The singularity plane is a point at which this Universe touches another smoothly. Okay? But because of the oscillations of the Ring, the contact point with the other universe isn’t a constant. It’s changing. Every few minutes - sometimes more frequently - the interface changes to another continuation region - to *another* universe.’

Morrow frowned. ‘Is that significant for us?’

Mark ran a hand through his hair. ‘Only because the changes aren’t predictable, either in timing or scope. Maybe the changes cycle round, for all I know, so if we wait long enough we’ll get a second chance.’

‘But we don’t have time to wait.’

‘No. Well, we’re not exactly planning this . . . We won’t be able to choose which universe we end up in. And not every universe is habitable, of course . . .’

Louise pressed her knuckles to her temples. *Good point, Mark. We've decided to commit ourselves to crashing out of our Universe, and we have half the Xeelee nightfighters in creation on our tails already and now you bring me this. What am I supposed to do about it?*

'Tell me what you see through there right now,' she said. 'Tell me about the universe on the other side of the Kerr interface.'

'Now?' Mark looked doubtful. 'Louise, you're asking me to come up with an analysis of a whole cosmos - based on a few muddled glimpses - in a few seconds. It's taken all of human history even to begin a partial—'

'Just do it,' she snapped.

He studied her briefly, his expression even. 'Some of the twin universes feature a degree of variation to our physical laws. That's no great surprise; the constants of physics are just an arbitrary expression of the way the symmetries at the beginning of time were broken . . . But even those universes with *identical* laws to ours can be very different, because of changed boundary conditions at the beginning of time - or even, simply, from being at a different stage of their evolutionary cycles to ours.'

'And in this particular case?' she asked heavily.

He closed his eyes. Louise could see that stray pixels, yellow and purple, were again migrating across the Virtual images of his cheeks. His eyes snapped open, startling her. 'High gravity,' he said.

'What?'

'Variation of the laws. In the neighbouring universe, the constant of gravity is high - enormously high - compared to, uh, *here*.'

Morrow looked nervous. 'What would that mean? Would we be crushed?'

More pixels, glitches in the image, trekked across Mark's cheeks. 'No. But human bodies would have discernible gravity fields. You could *feel* Louise's mass, Morrow, with a pull of about half a gee.'

Morrow looked even more alarmed.

'Stars could be no more than a mile wide, and they would burn for only a year,' Mark said. 'Planets the size of Earth would collapse under their own weight immediately . . .'

Lieserl frowned. 'Could we survive there?'

Mark shrugged. 'I don't know. The lifedome would implode immediately under its own weight. We'd need to find a source of breathable

air, and fast. And we'd have to live in free-fall; any sizeable mass would exert unbearably high gravitational forces. But maybe we could make some kind of raft of the wreckage of the *Northern* . . .'

Lieserl looked up into the singularity plane, and her expression softened. 'We know there have been human assaults in the Ring - like the neutron star missile. So perhaps we are not the first human pilgrims to fall through the Ring. Mark, you said the bridge to the other universe goes through cycles. I wonder if there are humans on the other side of that interface even now, clinging to rafts made from wrecked warships, struggling to survive in their high-gravity world . . .'

Mark smiled; he seemed to be relaxing. 'Well, if there are, we won't meet them. That continuation has closed off; a new one is opening . . . Wherever we're going, it won't be *there*.'

Louise glanced up at the false-colour sky. '. . . I think it's time to find out,' she said.

The *Northern* reached the zenith of its arc, high over the plane of the Ring.

Spinner felt as if she were suspended at the top of some huge cosmic tree, a million light-years high. The ship was poised above the singularity's central, glittering pool of muddled starlight, and beyond that, at the edge of her field of view, was the titanic form of the Ring itself.

The flock of nightfighters hovered in a rough cap around her and above her, their wings spread. The 'fighters were sharp, elegant forms, filling space.

Spinner-of-Rope closed her hands over the hyperdrive waldo.

Now, it was like tumbling out of the tree.

The nightfighter *fell* through space, covering ten thousand light-years every second.

The singularity is a gateway to other universes, Michael Poole said. *Who knows? - perhaps to better ones than this.*

In fact, Poole told her, there had to exist further gateways, in the universe beyond, to still more cosmoses . . . He painted a picture of a mosaic of universes, connected by the glowing doorways of positive and negative Kerr singularities. *It's wonderful, Spinner-of-Rope*.

Spinner stared down at the singularity. 'Is this what they intended? Did the Xeelee *mean* to construct the singularity as a gateway?'

Of course they did. Why do you think they made the singularity so damned big? . . . So that ships could pass through it, without being destroyed by tidal forces from the singularity thread.

Spinner-of-Rope, this is the Xeelee's most magnificent achievement. I would have liked to tell you some day how this Ring was built . . . how the Xeelee returned through time and even re-engineered their own evolution, to give themselves the capabilities to achieve this.

'You would have *liked* to tell me . . . ?'

Yes. Poole sounded sad. *Spinner, I'm not going to get the chance . . . I can't follow you*.

'What?'

It was as if she descended through an immense tunnel, walled by the distant, irrelevant forms of blue-shifted galaxies. The singularity was the starlit open base of that tunnel, out of which she would fall into—

Into what?

Still, the starling flocks of nightfighters swirled around the ship.

'You know,' she said, 'the Xeelee could have stopped us at almost any point. I'm sure they could destroy us even now.'

I'm sure they could.

'But they haven't.'

Perhaps they are helping us, Spinner-of-Rope. Maybe there is some residual loyalty among the baryonic species, after all.

' . . . Spinner-of-Rope.'

'Yes, Lieserl.'

'Listen to me. The trip through the singularity is going to be - complicated.'

'Oh, good,' Spinner said dryly.

'Spinner, the spacetime manifold around here isn't simple. Far enough out the singularity will attract us - draw us in. But close to the plane of the singularity, there is a *barrier* of potential in the gravitational field.'

She sighed. 'What does that mean?'

' . . . *Antigravity*, Spinner-of-Rope. The plane will actually repel us. If we don't have enough kinetic energy as we approach the plane, we'll be pushed away: either back to the asymptotically flat regions - I mean, to infinity, far from the plane - or else back into the zone of attraction. We could oscillate, Spinner, alternately falling and being repelled.'

‘What happens on the other side? Will we be drawn back into the plane?’

‘No.’ Lieserl hesitated. ‘When we pass through the plane, there is a co-ordinate sign change in the metric . . . The singularity will push us away. It will hurl us on, deep into the new universe.’

‘So what do I have to do?’

‘To get over the potential barrier, we need to build up our kinetic energy *before* we hit the plane of the singularity. Spinner, you’re going to have to operate your discontinuity drive *in parallel* with the hyperdrive. The fractions of a second between jumps, when we’re in normal space, will be enough to let us begin our normal-space acceleration.’

Spinner felt sweat trickle over her face, pooling under her eyes behind her spectacles. She was afraid, suddenly, she realized: but not of the singularity, or what might lie beyond, but of *failing*. ‘That’s ridiculous, Lieserl. How am I supposed to pull that off? What am I, a spider-monkey?’

Lieserl laughed. ‘Well, I’m sorry, Spinner-of-Rope. We’re making this up as we go along, you know . . .’

‘I can’t do it.’

‘I know you can,’ Lieserl said calmly.

‘*How* do you know?’

Lieserl was silent for a pregnant moment. Then she said, ‘*Because you have help*. Don’t you, Spinner-of-Rope?’

And Spinner felt the warm hands of Michael Poole close over hers once more, strong, reassuring.

The discontinuity-drive wings unfurled behind the hulk of the lifedome, powerful and graceful.

‘If it’s any consolation, Spinner, we’ll be a spectacular sight as we hit the plane,’ Lieserl said. ‘We’ll shed our Kerr plunge radiation in a single burst of gravity waves . . .’

The singularity plane was widening; it was a disc, filled with jumbled starlight, opening like a mouth.

‘Michael, will there be photino birds, in the new universe?’

I don’t know, Spinner.

‘Will there be Xeelee?’

I don’t know.

‘I want you to come with me.’

I can't. I'm sorry. The quantum functions which sustain me don't traverse the plane of the singularity.

The Xeelee 'fighters swirled around her cage, graceful, their night-dark wings beating. They filled space to infinity, magnificent here at the heart of their final defeat. The plane of the singularity was a sea of silver light below her.

The construction material of her cage, of the wings, began to *glow*, as if white-hot.

Michael Poole turned to her, and nodded gently. The construction-material light shone out through his translucent face, making him look like a sculpture of light, she thought. He opened his mouth, as if to speak to her, but she couldn't hear him; and now the light was all around him, engulfing him.

'Come with me!' she screamed.

And now, suddenly, dramatically, the singularity was *here*. Its rim exploded outwards, all around her, and she fell, helplessly, into a pool of muddled starlight.

She cringed into herself and clutched her hands to her chest; her worn arrow-head dug into her chest, a tiny mote of human pain.

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33

The lifedome was plunged into darkness. The jungle sounds beneath Louise were subdued, as if night had fallen suddenly . . . or as if an eclipse had covered the Sun.

The lifedome groaned, massively; it was like being trapped inside the chest of some huge, suffering beast. That was stress on the hull: the co-ordinate change, as the ship had crossed the singularity plane.

We have entered a new cosmos, then. Is it over? Louise felt like an animal, helpless and naked beneath a storm-laden sky.

Lieserl had spoken of how all of human history was funnelling through this single, ramshackle moment. If that was true, then perhaps, before she had time to draw more than a few breaths, her own life - and the long, bloody story of man - would be over.

. . . And yet the sky beyond the dome wasn't completely dark, Louise saw. There was a mottling of grey: elusive, almost invisible. When she stared up into that colourless gloom, it was like staring into the blood vessels she saw when she closed her own eyelids; she felt a disturbing sense of unreality, as if her body - and the *Northern*, and all its hapless crew - had been entombed, suddenly, within some gross extension of her own head.

There was a rasp, as of a match being struck. Louise cried out.

Mark's face, dramatically underlit by a flickering flame, appeared out of the gloom. Lieserl laughed.

'Lethe,' Louise said, disgusted. 'Even at a time like this, you can't resist showing off, can you, Mark?'

'Sorry,' he said, grinning boyishly. 'Well, the good news is we're all still alive. And,' more hesitantly, 'I can't detect any variation of the physical constants from our own Universe. It looks as if we may be able to survive here. For a time, at any rate . . .'

Lieserl snorted. 'Well, if this universe is so dazzlingly similar to our own - *where are the stars*?'

Now the lifedome began to lighten, as Mark kicked in image enhancing routines. It was almost like a sunrise, Louise thought, except that in this case the spreading light did not emerge from any one of the lifedome's 'horizons'; it simply broke through the muddy darkness, right across the dome.

In a few heartbeats, the image stabilized.

There *were* stars here, Louise saw immediately. But these were *giants* - and not like the bloated near-corpse which Sol had become, but huge, vigorous, brilliant white bodies each of which looked as if it could have swallowed a hundred Sols side by side.

The giants filled the sky, almost as if they were jostling each other. Several of them were close enough to show discs, smooth white patches of light.

Nowhere in her own Universe, Louise realized, could one have seen a sight like this.

Beside her, Lieserl sighed. ‘Uh-oh,’ she said.

PART VI
EVENT: NEW SOL

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34

The light of New Sol gleamed from the pod's clear hull, unremitting, blinding. Louise watched the faces of Mark, Spinner-of-Rope and Morrow as they peered out at the new cosmos. The pod turned slowly on its axis, and the brilliant young lamps of this new universe wheeled around them, bathing their profiles in intense white brilliance.

For their new sun, the crew of the *Northern* had selected a particular VMO: a *Very Massive Object*, a star of a thousand Solar masses - a typical member of this alternate cosmos. This star drifted through the halo of a galaxy, outside the galaxy's main disc. Huge shells of matter - emitted when the star was even younger - surrounded New Sol, expanding from it at close to the speed of light.

The *Great Northern* itself hovered, a few miles from the pod. By the harsh, colourless light of New Sol Louise could see the bulky outline of the lifedome, with the sleek, dark shape of the Xeelee nightfighter still attached to the dome's base - and there, still clearly visible, was the hull-scar left by the impact with the strand of cosmic string.

The battered ship orbited the new sun as timidly as ice comets had once circled Sol itself - so widely that each 'year' here would last more than a million Earth years. The ship was far enough away that the VMO's brilliance was diminished by distance to something like Sol's. But even so, Louise thought, there was no possibility that the VMO could ever be mistaken for a modest G-type star like Sol. The VMO was only ten times the diameter of old Sol, so that from this immense distance the star's bulk was reduced to a mere point of light - but its photosphere was a hundred times as hot as Sol. The VMO was a dazzling point, hanging in darkness; if she studied it too long the point of light left trails on her bruised retinae.

Externally, the *Northern*'s lifedome looked much as it had throughout its long and unlikely career: the ship's lights glowed defiantly against the glare of this new cosmos, and the forest was a splash of Earth-green, flourishing in the filtered light of New Sol. But inside, the *Northern* had become very different. In the year since its arrival through the Ring, the dome had been transformed into a workshop: a factory for the manufacture of exotic matter and drone scoop-ships.

Morrow, beside Louise, was blinking into the light of New Sol. His cupped hand shaded his eyes, the shadows of his fingers sharp on his face. He was frowning and looked pale. He caught Louise's glance. 'Things are certainly different here,' he said wryly.

She smiled. 'If we ever build a world here, it won't have a sun in the sky. Instead, by day there will be this single point source, gleaming like some unending supernova. The shadows will be long and deep . . . and at night, the sky will shine. It's going to seem very strange.'

He glanced at her sharply. 'Well, it will be strange for those of you who remember Earth, I guess,' he said. 'But, frankly, there aren't so many of you around any more . . .'

Now the pod's rotation carried the new sun out of visibility, below the pod's limited horizon. And - slowly, majestically - the lights of their new galaxy rose over their heads.

This galaxy was a flat elliptical, but would have seemed a dwarf compared to the great galaxies on the other side of the Ring: with a mass of a billion suns, the star system was a mere hundredth the bulk of the Milky Way, or Andromeda, and not much larger than the old Magellanic Clouds, the minor companion galaxies to the Milky Way. And - since the average size of stars here was a hundred times greater than in the Milky Way - there were only ten million stars in this galaxy, compared to the Milky Way's hundred billion . . . But every one of those stars was a brilliant white VMO, making this galaxy into a tapestry of piercingly bright points of light. It was like, Louise thought, surveying a field of ten million gems fixed to a bed of velvet.

This universe was crowded with these bland, toy galaxies; they filled space in a random but uniform array, as far as could be seen in all directions. This cosmos was *young* - too young for the immense, slow, processes of time to have formed the great structures of galactic clusters, superclusters, walls and voids which would one day dominate space.

Morrow stared up uneasily at the soaring form of the galaxy. Apparently unconsciously, he wrapped both hands across his stomach.

'Morrow, are you okay?'

'I'm fine,' he told Louise, unconvincingly. 'I guess I'm just a little susceptible to centrifugal force.'

Louise patted his hands. ‘It’s probably Coriolis, actually - the sideways force. But you shouldn’t let the pod’s rotation bother you,’ she said. She thought it over. ‘In fact, you should *welcome* your motion sickness.’

Morrow raised his shaven eyebrow ridges. ‘Really?’

‘It’s a sensation that tells you you’re *here*, Morrow. Embedded in this new universe . . .’

The laws of physics were expressions of basic *symmetries*, Louise told him. And symmetries between frames of reference were among the most powerful symmetries there were.

Morrow looked dubious. ‘What has this to do with space-sickness?’

‘Well, look: here’s a particular type of symmetry. The pod’s rotating, in the middle of a stationary universe. So you feel centrifugal and Coriolis forces - twisting forces. The forces are what is making you uncomfortable. But what about *symmetry*? Try a thought experiment. Imagine that the pod was stationary, in the middle of a rotating universe.’ She raised her hands to the galaxy wheeling above them. ‘How would you tell the difference? The stars would look the same, moving around the pod.’

‘And we’d feel the same spin forces?’

‘Yes, we would. You’d feel just as queasy, Morrow.’

‘But where would the forces come from?’

She smiled. ‘That’s the point. They would come from the inertial drag of the rotating universe: a drag exerted by the huge river of stars and galaxies, flowing around you.

‘So you shouldn’t be worried by, or embarrassed by, your queasiness. That’s the feeling of your new universe, plucking at you with fingers of inertial drag.’

He smiled weakly, and ran a palm over his bare, sweat-sprinkled scalp. ‘Well, thanks for the thought,’ he said. ‘But somehow it doesn’t make me feel a lot better.’

Spinner-of-Rope and Mark were sitting in the two seats behind Louise and Morrow. Now Mark leaned forward. ‘Well, it should,’ he said. ‘The fact that general relativity is working here - as, in fact, are all our familiar laws as far as we can tell, to the limits of observation - is the reason we’re still alive, probably.’

Spinner-of-Rope snorted; VMO light gleamed from the arrow-head pendant she still wore between her breasts. ‘Maybe so. But if this universe

is so damn *similar*, I don't see why it should be so *different*. If you see what I mean.'

Mark spread his hands, and tilted his head back to look at the dwarf galaxy. 'The only real difference, Spinner, is one of point of view. It's all a question of *when*.'

Spinner frowned. 'What do you mean, "when"?' Behind her spectacles Spinner's small, round face seemed set, intent on the conversation, but Louise noticed how her hands tugged at each other endlessly, like small animals wriggling in her lap. Spinner-of-Rope had been left too long in that nightfighter pilot cage, Louise thought. Spinner had seen too much, too fast . . .

Since she'd been retrieved from the cage Spinner had *seemed* healthy enough, and Mark assured Louise that she'd retained her basic sanity. Even her illusion of communicating with Michael Poole - an illusion she'd dropped as they came through the Ring - seemed to have had *some*, unfathomable, basis in reality, Mark said.

Fine. But, Louise sensed, Spinner-of-Rope still wasn't fully recovered from her ordeal. She still wasn't *whole*. It would take time - decades, perhaps - for the post-traumatic stress to work its way out of her system. Well, Spinner-of-Rope would *have* the time she needed, Louise was determined.

Mark said, 'Spinner, this universe is just like ours - except that it's around twenty billion years younger.

'This is a baby cosmos. It emerged from its own Big Bang less than a billion years ago. And it's *smaller* - spacetime hasn't had the time to unravel as far as in our old Universe, so this cosmos is something of the order of a hundredth the size. And the stars—'

'Yes?'

'Spinner, these are the first stars ever to shine here. Not one of the stars we see out there is more than a million years old.'

Out of the primordial nucleosynthesis of the singularity, here, had emerged clouds of hydrogen and helium, with little contamination by heavier elements. The new sky had been dark, illuminated only by the dying echo of the radiation which had emerged from the singularity. Then the gas clouds gathered into proto-galactic clumps, each with the mass of a billion

Sols. Thermal instabilities had caused the proto-galaxies to collapse further, into knots with mass a hundred Suns or more.

Soon, the first of these smooth-burning stars had guttered to life: brilliant monsters, some with the mass of a million Suns.

Slowly, the sky had filled with light.

‘The way these stars were born is unique,’ Mark said, ‘because they are the *first*. There were no previous stars. So the proto-galaxies were a lot smoother - the gas clouds weren’t all churned up by the heat and gravity of earlier generations of stars. And the gas was free of heavy elements. Heavy elements act to keep young stars cooler, and to limit the size of the stars that form. That’s why these babies are so immense.

‘These are what we call Population III stars, Spinner. Or VMOs - “Very Massive Objects”.’

‘If they are so massive,’ Spinner said slowly, ‘then I guess they won’t last so long as stars like Sol.’

Louise looked at her appreciatively. ‘That’s perceptive, Spinner. You’re right. The VMOs burn their hydrogen fuel quickly. Each of these is going to stay on its Main Sequence for no more than a few million years - two or three, at best. The Sun, on the other hand, should have survived for tens of *billions* of years, without the interference of the photino birds.’

‘What then?’ Spinner asked. ‘What do we do when New Sol goes out?’

Morrow smiled. ‘Then, I guess, we move on: to another star, and another, and another . . . We have time here to work that out, I think, Spinner-of-Rope.’

Now New Sol was rising again, over the lip of the pod. The four of them turned instinctively to the light, its flat whiteness smoothing the lines of age and fatigue in their faces.

‘In fact,’ Mark said, ‘the star we’ve chosen - New Sol - is already well past its middle age. It’s probably got no more than three-quarters of a million years of its life left.’

Spinner frowned. ‘That seems stupid. Why not choose a young star, and move there while we can? It may be that when New Sol dies we won’t be *able* to move away.’

‘No,’ Mark said patiently. ‘Spinner, we *need* an older star.’

The star called New Sol was nearing the end of the *second* phase of its existence. In the first, it had burned hydrogen into helium. Now, helium was

fusing in turn, and a rain of more complex elements had formed a new, inner core: principally oxygen, but also neon, silicon, carbon, magnesium and others.

And later, in the third phase of its life, when the oxygen started to burn, the star would die . . . although *how* was far from certain.

‘Terrific,’ Spinner said. ‘And we die with it.’

‘No,’ Mark said seriously. ‘Spinner-of-Rope, we die *without* it. Don’t you get it? New Sol is full of *oxygen* . . .’

Morrow was pointing, excitedly. ‘Look. *Look*. There’s the wormhole . . . I think it’s almost time.’

Louise turned in her seat.

Now a new form emerged over the rotating pod’s horizon: the familiar shape of a wormhole Interface. This Interface was only a hundred yards across - far smaller than the mile-wide monster the *Northern* had hauled across a different spacetime - but, like its grander cousins of the past, it shared the classic tetrahedral frame, the shining electric blue colour of its exotic matter struts, and the autumn-gold glimmering of its faces. A dozen drone scoop-ships prowled around the Interface, patient, waiting.

Louise felt a prickle of tears in her eyes; she brushed them away impatiently. *Already*, she thought, *we are building things here. Already, we are engineering this universe.*

Mark said to Spinner, ‘If there were planets here we could land and try to terraform one. But there *are* no planets for us to land on. *Anywhere*. This is a very young universe. There are no more than traces of heavy elements here, anywhere, outside the interior of the protostars. There are no moons, no comets, no asteroids . . . We have no raw materials to build with, save the hulk of the *Northern* - save what we brought here ourselves. We can’t even renew our atmosphere.’

Morrow nodded. ‘So,’ he said, ‘we’re mining the star.’

The second terminus of this wormhole had been dropped into the carcass of New Sol. Lieserl had accompanied the Interface - just as once she had travelled into the heart of Sol itself. Soon, enriched gases from the heart of the new star would pour into space - *here*, far from the heat of New Sol, accessible.

The scoop-ships had mouths constructed of electromagnetic fields which could gather in the star-dust across volumes of millions of cubic

miles. When the wormhole started to operate, the scoops would sift out the few grains of precious heavy elements.

‘The first priority is atmospheric gases,’ Mark said. ‘We lost a lot of our recyclable reserve during the string impact. Another blow-out like that and we’d be finished.’

‘Are all the gases we need there, inside the star?’

‘Well, there’s plenty of oxygen, Spinner,’ Louise said. ‘But that’s not enough. An all-oxygen atmosphere isn’t particularly stable - it’s too inflammable. We need a neutral buffer gas, to contribute to the hundreds of millibars of pressure we need to stay alive.’

‘Like nitrogen,’ Spinner said.

‘Yes. But there isn’t much nitrogen in New Sol. We should be able to use neon, though . . .’

‘We can replace our other stores. Use the oxygen to make water and food.’

‘We can do more than that, Spinner-of-Rope,’ Mark said. ‘In the longer term we can extract heavier elements: magnesium, silicon, carbon - maybe even iron. They are only present in traces in New Sol, but they’re *there*. We can build a fleet of *Northerns*, if we’re patient enough. Why, we can even make rocks.’

Spinner looked out at New Sol, and the point light glittered in her eyes, making her look very young, Louise thought. Spinner said, ‘It’s chilling to think that - except maybe for the Xeelee - we’re *alone* here, in this universe. Stars like this once burned in our Universe - but they were all extinguished, destroyed, long before humans became conscious.

‘We may survive for millions of years here. But, finally, we’ll be gone. New Sol, and all these other stars, will destroy themselves. Eventually, a new generation of stars will form in the enriched galaxies - stars like Sol. And, I guess, intelligence will arise here . . .

‘But not for billions of years after we’re gone.’

Spinner turned to Louise, her eyes large, her expression fragile, troubled. Her hands tugged at each other’s fingers, and played with the arrow-head pendant at her chest. ‘Louise, nothing we build could survive such a length of time. No conceivable monument, or record, could persist. We’ll be forgotten. No one will ever know we were here.’

Louise reached over the back of her chair and took Spinner's hands in hers, stilling their nervous motions. Again she felt a surge of responsibility for Spinner's fragile state. 'That's not true, Spinner,' she said gently. 'We'll still be there. These VMOs will leave traces in the microwave background - peaks of energy against the smooth radiation curves. There were traces like that in the microwave spectrum of our own Universe - that's how we know of our own primordial VMOs. And there will be other traces, relics of this time. These giant proto-stars will enrich the substance of the young galaxies here, with heavy elements. Without the heavy elements stars like old Sol could never form . . . and we'll be part of that enrichment, Spinner-of-Rope, tiny traces, atoms which formed in a different universe.'

Spinner-of-Rope frowned. 'A blip in the microwave background? Is that to be our final monument?'

'It might be sufficient to let the people of the future work out that we were here, perhaps. And besides, we might have a billion years ahead of us, Spinner. Time enough to think of something.' She stroked Spinner's hands. 'It would take a long time, but we could *build* a planet for ourselves, out here on the lip of New Sol's gravity well.' She smiled. Maybe they could construct an ocean, wide enough for the *Great Britain* to sail again. What would old Isambard have made of that? And—

'No,' Morrow said mildly.

Louise turned to him, surprised. His face, gaunt, shaven of hair, was smooth and confident-looking in the light of New Sol.

'What did you say?' Louise asked.

He turned to her. 'Planets are *inefficient*, Louise. Oh, they're convenient platforms if they exist already. But - to *build* a planet? Why bury all that painfully extracted matter *inside* your habitable surface?'

Louise found herself frowning; she was aware of Mark grinning at her, irritatingly. 'But what's the alternative?'

Morrow said, 'We can build structures in space: rings, hollow spheres - the point is to *maximize* the habitable surface available for a given mass - to spread it out as much as possible. Louise, a spherical planet gives you a *minimum* surface for a given mass.'

Louise studied Morrow curiously. His motion sickness was still evident in the pallor of his thin face, but he spoke with a vigour, a clarity she wouldn't have believed possible when she'd first met him, soon after his

emergence from the Decks. Was it possible that the centuries of oppression, of body and soul, which he had endured in there, were at last beginning to lift?

Mark smiled at her. ‘You’d better face it, Louise. You and I grew up on worlds, and so we think in terms of rebuilding what we’ve lost. We’d better move aside, and leave the future to these bright young kids.’

She found herself grinning back. She whispered, ‘Okay, I take your point. But - *Morrow*, as a bright young kid?’

‘Maybe we’ll just build ships,’ Spinner said intently. ‘Whole armadas of them. We can simply *fly*; who needs to land, anyway? We could spread out, here. Maybe the Xeelee are here already - we came through *their* gateway, after all. We could see if we can find them . . .’

Mark scratched his chin. ‘That’s a good agenda, Spinner-of-Rope. You know, I think Garry Uvarov would be proud of you.’

She glared at him. She pulled her hands away from Louise, and for a moment - with her streak of scarlet face paint, and spectacles glinting with New Sol light - Spinner reminded Louise of the savage little girl she’d once been.

‘Maybe he would,’ Spinner snapped. ‘But so what? I’m not a *creation* of Garry Uvarov. Uvarov was an oppressor, insane.’

Louise shrugged. ‘Perhaps he was, in the end - and capricious. But he was also insightful, iconoclastic. He never let us turn away from the truth, in any situation, no matter how uncomfortable that was . . .’

Uvarov hadn’t deserved to die, blind and alone, in a remote, deserted future. Maybe Uvarov had been right, too, in the motives behind his great eugenics experiment. Not in his methods, of course . . . But perhaps a natural, technology-independent immortality was a valid goal for the species.

Louise was aware that she and her crew had gone to a great deal of trouble to preserve the *essence* of humanity, through the collapse of the baryonic Universe. They hadn’t sent mere records of humankind through the Ring, or Virtual representations of what man had been: they’d brought *people*, with all their faults and ambiguities and weaknesses, and *plumbing*. And now that they’d succeeded, perhaps it was time for human stock to begin to develop: to face up to and exceed the limitations, of body and

spirit, which had, at last, caused the extinction of humanity in the old, abandoned Universe.

She wondered if, in several generations' time, the descendants of Spinner-of-Rope would indeed sail through this new universe in their sparkling ships. Perhaps when they finally met the Xeelee, it would be on equal terms; perhaps the new humans would be strong, immortal - and *sane.*

' . . . It's starting!' Morrow said, his voice high and tense. He pointed, his sleeve riding up his arm. 'Look at *that*.'

In a sudden eruption of light, gas blossomed from the four faces of the Interface. Still fusion-burning as it emerged, the gas rapidly expanded into a growing, cooling cloud. Louise could see the tetrahedral form of the Interface itself at the blazing heart of this animated sculpture of gas.

Diffuse light flooded the pod. It was as if a new, tiny star had ignited, here on the fringe of New Sol's gravity well. The drones flickered open their electromagnetic scoops and moved into the glowing, dispersing clouds, browsing patiently.

'Lethe's waters,' Morrow breathed. 'It's beautiful. It's like a flower.'

'More than that, Mark said with a grin. 'It's beautiful because it's bloody *worked*.' He turned to Louise, his blue eyes brilliant, and his face looked youthful and alive.

'Louise,' he said, 'I think we might live through this after all.'

Louise reached for the pod's controls. The first loads of atmospheric gases would be arriving soon. And there were homes to be built. It was time to return to the *Northern* and get back to work.

Life would go on, she thought: as complicated, and messy, and *precious*, as ever.

Once again Lieserl spread her arms and soared through the interior of a star. But now her playground was no mere G-type yellow dwarf like the Sun: this was *New Sol* - a supergiant, salvaged for her from the dawn of time, fully ten million miles across.

Lethe's waters. I'd forgotten how wonderful this feels - how restrictive a human body could be . . .

I was born for this, she thought.

She arced upwards towards the photosphere - the star's surface was a wall of gas which seared space at a temperature of a hundred thousand degrees - and then she dived, yelling, down into the core. In Sol, the fusing

core had been confined to the innermost few per cent of the diameter. Here, the core *was* the star, extending out almost to the photosphere itself. There was fusion burning *everywhere*. All around her helium burned into oxygen, dumping prodigious quantities of heat energy into the star's opaque flesh. In response, immense convective cells - some of them large enough to have swallowed Sol itself - surged through the interior.

This star was no more than a couple of million years old. But already - to her intense regret - she'd missed one of the most interesting phases of its existence.

The star had formed as a ball of fusing hydrogen, two thousand times more massive than the Sun. There had been convection cells then, too, which had driven instabilities in the giant star; it had breathed, swelling and contracting through fully a tenth of its diameter in a day. The instabilities had grown, exponentially, resulting at last in the casting off of huge shells of material from the surface of the star, like a series of repeated nova explosions; the *Northern* had sailed in through those ancient shells, on its way to its orbit around the new sun.

Meanwhile, the helium core had grown, and steadily contracted, and heated up.

At last, the core reached half the mass of the original VMO - about a thousand Solar masses. And a shell of hydrogen around the core ignited.

The mass of *three* Suns was flashed to energy within mere hours - expending energy that could have fuelled Sol for ten billion years of steady burning. The wind from the explosion stripped off the still-fusing envelope, creating another expanding shell around a remnant helium star.

Now, as Lieserl flew through the star, the helium was in turn burning to oxygen, which was being deposited in the star's core. Eventually, the oxygen would ignite. And then—

And then, the outcome wasn't certain. Her processors were still working on predictions: gathering data, developing scenarios. It all depended on critical values of the star's mass. If the mass was low enough the star could survive, for many millions of years, its diameter oscillating slowly . . . and rather dully, Lieserl thought. But a little larger and the star could destroy itself in a supernova explosion - or, if massive enough, collapse into a black hole.

Lieserl studied the data streams trickling into her awareness. She would know soon. She felt a shiver of excitement. If the star was unstable, the end would come well within a million years. And then—

. . . *Lieserl*?

The voice of Louise Ye Armonk broke into her thoughts. *Damn*. Lieserl lifted her arms over her head and plunged into a huge convection fountain; the fusing star-stuff played over her Virtual body, warming her to the core.

But she couldn't escape Louise's voice, any more than she'd been able to outrun Kevan Scholes.

Come on, Lieserl. I know you can hear me. I'm monitoring your data feeds, remember—

Lieserl sighed. 'All right, Louise. Yes, I can hear you.'

Lieserl - Louise hesitated, uncharacteristically.

'I think I know what you're going to say, Louise.'

Yes. I bet you do, Louise growled. *Lieserl, we're grateful to you for going into New Sol with the wormhole Interface. And you're sending us a lot of great data. But . . .*

'Yes, Louise?'

Lieserl, you didn't leave a back-up.

'Ah.' Lieserl smiled and closed her eyes. The neutrino flux from the heart of New Sol brushed against her face, as delicate as a butterfly's wing. 'I wondered how long it would take you to notice that.'

Damn it, Lieserl, that's the only copy of you in there!

'I know. Isn't it wonderful?'

You don't understand. What if something happened to you? Louise went on heavily, *Lieserl, we've never dropped a wormhole into a VMO before. We're not sure what will happen.*

'No. Well, before my day no one had ever dropped a wormhole into Sol. Nothing much changes, does it?'

Damn it, Lieserl. I'm trying to tell you that you could die.

'Don't you think I know that? Don't you see - that's the whole point?'

Louise didn't reply.

'Louise, I'm very old. I've *watched* my birth star grow old and die. I'm grateful to you for retrieving me from Sol: I wouldn't have missed that ride through the Ring for . . . for half my memory store. But, Louise, I don't think I can be a human any more - not even a Virtual copy of one. And I

don’t want to build worlds . . . that is for Spinner-of-Rope, and Trapper, and Painter-of-Faces, and the other children from the forest and the Decks. Not for me.’

Lieserl, do you want to die?

‘Oh, Louise. I’ve already died once - or so we think, on the neutron star planet with poor Uvarov - and I never even felt it. I don’t want to go through that again.

‘This is where I want to be, Louise. Here, inside this new star.’ She smiled.

‘It’s what I was designed for, remember.’

Louise was silent for a while. Then: *Come home, Lieserl.*

‘Louise - dear Louise - I *am* home.’

Lieserl—

Wistfully, she shut off the voice link to the *Northern*. She’d open it later, she told herself: when Louise had grown accustomed to the idea that Lieserl was *here* - here and nowhere else - and here she was going to stay.

And in the meantime, she realized with growing excitement, the processors lodged in the refrigerating wormhole had come to a conclusion about the destiny of her star, New Sol.

She called up a Virtual image of the star; it rotated before her, a crude onion shell.

Already, she knew, oxygen was burning in pockets throughout the star, depositing the more complex elements - carbon, silicon, neon, magnesium - for which the wormhole was designed to trawl. With time, the helium-burning core of the star would contract, leaving a mantle of cooling helium and ash around a centre growing ever hotter.

At length - perhaps in half a million years, the processors concurred - oxygen burning would start in earnest in the core . . .

With growing excitement Lieserl watched the Virtual diorama, ready to learn how she would die.

When oxygen burning started in the core, the star would become immediately unstable.

The mantle would explode. The rotating star would start to collapse, asymmetrically.

Then the core would implode, precipitously.

The giant star's gravitational binding energy would be converted into a flood of neutrinos, billowing through the collapsing core. Some of the neutrinos would be trapped by the implosion of the core. Others, in the last few milliseconds before the VMO's final collapse into a black hole, would escape as an immense neutrino pulse . . .

She remembered the first seconds of her life: her mother's hands beneath her back, a dazzling light in her eyes. *The Sun, Lieserl. The Sun!*

In the last moments of her long life, a neutrino fireball would play across the bones of her face.

Lieserl smiled. It would be *glorious.*

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35

Time passed. After a certain point, even the measurement of time became meaningless. For Michael Poole this moment arrived when there was no nuclear fuel left to burn anywhere, and the last star flickered and died.

Already the Universe was a hundred thousand times its age when the Xeelee left.

Sombrely Poole watched the stars evaporate, through collisions, from the subsiding husks of galaxies, or slide into the huge black holes forming at the galactic centres. Then, as the long night of the cosmos deepened, even protons collapsed, and the remaining star-corpses began to crumble.

Poole wearied of puzzling over the huge, slow projects of the photino birds.

He sought out what had once been a neutron star. The carbon-coated sphere, drifting in orbit around a gigantic black hole, was being warmed - at least, kept to a few degrees above absolute zero - by proton decay within its bulk. Poole, as if seeking comfort, clustered his attention foci close to this shadow of baryonic glory.

Maybe there were other baryonic sentients left in the Universe. Maybe there were even other humans, or human derivatives. Poole did not seek them out. With the closure of the Ring, the baryonic story was done.

Michael Poole, alone, huddled close to the chill surface of the neutron star. His awareness sparkled and subsided.

The river of time flowed, unmarked, towards the endless seas of timelike infinity.

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TIMELINE

This outline timescale provides the context for the novels in this collection, as well as those of the 'Destiny's Children' series (***Coalescent***, 2003, ***Exultant***, 2004, ***Transcendent***, 2005). For a full timeline of the 'Xeelee Sequence' of novels and stories, please see www.stephen-baxter.com.

	time-travel invasion by Qax to AD 3829 (***Timelike Infinity***).
AD 5407:	Overthrow of Qax. Third Expansion begins under Coalition government.
AD 10,000+:	Humans dominant sub-Xeelee species. Rapid expansion and absorption of species and technologies. Launch of Xeelee timeships into deep past.

Era: ***The War for the Galaxy***

AD 24973:	Events of ***Exultant***. The human conquest of the centre of the Galaxy.
c.AD 25,000+:	Collapse of central Coalition government. Conflict among successor states.
c.AD 40,000+:	The Bifurcation of Mankind.

ERA: ***The War to End Wars***

c.AD 90,000+:	Reunification.
c.AD 100,000+:	Human assaults on Xeelee concentrations across the supercluster of galaxies.
AD 104,858+:	Events of ***Raft***
c.AD 193,700:	Events of ***Flux***
c.AD 200,000+:	Establishment of Commonwealth by 'undying'. Continued conflict with Xeelee.
c. AD 500,000:	Events of ***Transcendent*** (see also AD 2047). The retreat of mankind begins. Fragmentation of human unity.
c.AD 1,000,000:	Final siege of Sol system by Xeelee. Defeat and imprisonment of mankind.

ERA: ***Flight***

c.AD 1–4,000,000:	Xeelee and photino birds' transformation of baryonic universe.
c. AD 4,000,000+:	Migration of Xeelee through Ring. Sol leaves Main Sequence.
c.AD 4,900,000:	Final destruction of Ring by photino birds begins.

ERA: ***Photino Victory***

c.AD 5,000,000+:	Last humans return to Sol in GUTship *Great Northern*, and travel to Ring.
	Events of ***Ring*** (see also AD 3951).
AD 10,000,000+:	Virtual extinction of baryonic life.

Singularity: Timelike Infinity

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